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A Contribution to our Knowledge of South Indian Coccidae

BY

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A Contribution to our Knowledge of South Indian Coccidæ.

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Introduction.

THIS family of insects—including what are popularly known as scale insects and mealy-bugs—is one of those groups of lower animals which have not received sufficient attention till now in South India. This is due to various causes. In the first place, most of the members of this family are in their general structure and habits quite unlike the ordinary run of insects; they are generally minute and inconspicuous and often mistaken for lifeless things and overlooked. Secondly, the comparatively rare occurrence of these insects on ordinary field crops has also retarded the attention which these creatures might otherwise have received in company with insects affecting ordinary crops. While the great majority of scale insects and mealy-bugs infest trees of different kinds, garden shrubs, ornamental plants, etc., there are very few of them which infest field crops like paddy, sorghum, cotton, etc. In parts of America, South Africa and Australia where fruit trees are extensively grown, some of these insects have become serious pests, and in certain cases assumed the status of a regular menace to fruit culture. A well-known scientific worker in California remarks, "If we except the water problem, and possibly that of fertilizers and cultivation, no question concerns the growers of *Citrus* fruits in California more than that of scale insects." The well-known San Jose Scale, the Fluted Scale, the Cottony Cushion Scale and the Red Orange Scale are only a few of the notorious pests of this family of insects causing considerable trouble in the orchards of America, Australia and various other countries in the tropics. In South India, on the other hand, with the exception of two members of this group, the Green and the Brown Bag of Coffee with which some of the European planters in the hill districts are familiar, very little is known of the individuals of this family, although numerous species occur in the country.

In view of the fact that some attention is nowadays being paid all over the country to develop fruit culture, there is a chance of these insects,

many of which are partial to fruit trees, coming into some prominence. Perhaps, it is not well known that some of these scale insects are introduced from country to country in nursery stock, fruits, hot house plants, etc., and when thus introduced some often exhibit a tendency to become very serious pests in their new homes. There is no other group of insects the ravages of which have been so much increased by human agency than the family of Coccidæ. And in order to prevent this spread of noxious insects even legislation is resorted to in many countries. "Scale insects are, as a rule, small and inconspicuous singly, but they multiply so rapidly that very soon an entire plant becomes infested - trunk, limbs, leaves and fruit. The infested tree is rarely killed outright, but its growth may be almost completely checked and its fruit products rendered valueless." Watt and Mann in their account of the "Pests and Blights of Tea" remark, "It is of the greatest importance that these insignificant-looking insects should be clearly recognized and their injurious action fully understood, not merely because of the present injury they are effecting, but to a far great extent because of their possibilities of infinite mischief in the future."

The object of this paper is, therefore, to give an account of the species of Coccids so far known to occur in South India with special reference to those having some economic importance. and I believe it may be of some use not only to those who are doing systematic work on this group to add to the knowledge of the Coccid fauna of the country, but to many prospective planters, orchardists, horticulturists and nurserymen; to the latter the paper might be of some help in recognizing these creatures when they happen to infest their plants and thus get timely warning to devise early measures to control them. As far as possible all minute structural details or technicalities are avoided both in the text and in the illustrations.

General features and life-history of Coccidæ.

A few introductory remarks regarding the general features in the structure and life-history of Coccids will not perhaps be out of place here. The insects belonging to this group are all small in size, the giants of the family not measuring more than an inch at the most. Almost all of them have some sort of covering produced by the insect itself; this covering may be of waxy, horny, glassy or resinous secretion, or some sort of powdery white material. Those having a clothing of loose white mealy substance are generally called mealy-bugs, all others being known as scale insects. The adult female is wingless and leads a stationary life fixed to the plant surface except in the case of mealy-bugs which are able to move about slowly all their life.

All are vegetable feeders and possess a well developed thread-like sucking tube by means of which the plant sap is sucked up. The following will give a brief idea of the life-history of a typical scale insect : of course, there are exceptions to this.

The female insect produces numerous minute eggs and out of these tiny larvæ hatch out ; these larvæ possess 6 legs, a pair of feelers, a well-developed feeding tube and minute eyes. The larvæ crawl about the tender branches of the host plant and after a time, which may be a day or two, anchor themselves at some spot on the tree by means of the beak and there grow by feeding on the plant sap. The periodical moulting takes place and the larva then loses its original form, becoming a small footless mass covered over by a scale-like secretion. The male and female larvæ are very rarely separable at this stage. After one or two more moults the male insect generally emerges out as a small delicate wingless or a two-winged creature, mates with the female and then dies. The females, on the other hand, become fixed to the plant for life : they lose their feet, feelers, etc., becoming irregular in shape, and grow by feeding on the plant sap and secreting the scale-like cover called the puparium. They are fertilized by the male and after this the female insects grow rapidly and the outer scale increases in size. By the time the eggs inside the female become mature and approach the hatching time, the soft portions of the mother under the scale gradually shrink and she dies away allowing the eggs to hatch and thus giving rise to a fresh generation. The puparia of male insects are generally smaller in size, and it is the scales of the female Coccids that we often see prominently on badly infested plants. The puparia of the male and female insects of the same species many a time show differences in structure.

In addition to reproduction by actual sexual union, many of these insects possess the power of reproducing by parthenogenesis, a phenomenon where the female insect is able to produce young offspring without the help of the male : in many species the male is still unknown. Some species of Coccids instead of giving rise to eggs very often produce viviparous young ones. These properties account for the enormous and rapid multiplication of these insects. The period of their greatest activity is summer and it is during this time they breed rapidly. In the cold or rainy weather, though they are dormant, breeding continues, but at a very much reduced rate.

Distribution and means of dispersal.

There is hardly any tree or plant which is not subject to the attacks of one kind or other of scale insect ; some attack cultivated plants of

different kinds, while a good many others are found on various wild plants and trees. There are, however, certain species which confine themselves to certain kinds of plants, while others are general feeders and found on various kinds of different plants. Change of conditions often brings about remarkable changes in the habits of these insects, and we cannot say when one apparently harmless species may become a pest and when a wild feeder might transfer its activities to cultivated plants. Though these insects are stationary for the greater part of their lives, there are various agencies which play their part in spreading scale insects from tree to tree and from one tract to another. It may often be surprising to note how these insects, many of which are not only wingless but footless, become so very widely distributed. This is explained by the fact that during the very early stages in the life of these insects when the minute larvæ are fairly active and move about in the different parts of the host plant they are easily carried on the limbs and bodies of various animals which visit this plant. Common examples of these are various kinds of beetles, caterpillars, spiders and different kinds of birds; often eggs of scales are rubbed off by such animals and carried to new localities. The following observations of Hubbard on this point will be found very interesting:—"During the migratory stage the restless habit of the young bark lice impels them to crawl about actively, turning aside for no obstacles but mounting every object met with in their path. The instinct of self-protection being entirely wanting in these degraded creatures, they make no distinction between dead and living objects, and crawl without hesitation upon the bodies of other and larger insects. The latter impelled by the annoying presence of the intruders fly away bearing with them the scale larvæ, and thus assist in distributing them upon surrounding plants. But spiders more than any other animals must be considered efficient instruments in this mischievous work. Not only do they transport the lice—and it is an observed fact that the movements of the latter upon their hairy backs do not incommode the spiders—but they also harbour them under their webs in folded leaves, etc., where safe from the attacks of parasites and enemies they increase and multiply inordinately." Ants of various kinds play a very important part in the dissemination of different kinds of Coccidæ, especially the unarmoured species of the family. A strong wind or storm is also able to carry away these delicate young ones from tree to tree.

In addition to all these, there is the important factor of human agency sending plants and trees of various kinds from one place to another. The spread of many scale pests might be traced to this agency since at present there are easy facilities for transport of infested fruits, shrubs,

plants, etc., from one part of the world to another. It is a knowledge of this method of dissemination by commerce that has made many advanced countries to establish a quarantine system to prevent the introduction of new and undesirable pests into their country. India is at present fortunately free from some of the worst scale pests which do considerable damage in the Western countries, and if sufficient precaution is not resorted to in time there is little doubt that some of these bad pests might gain entrance into the country. It is due to the importance of this aspect of the question that I have dwelt at some length on the distribution of Coccidae.

Enemies of Coccidae.

Of the enemies of Coccids the most important are ladybird beetles and small hymenopterous wasps. The former are generally predaceous, while the minute wasps are internal parasites. In some of the Western countries where a knowledge of these enemies has considerably advanced, attempts have been made to import such natural enemies of scale insects from foreign countries as a method of control, and in some countries this method of checking certain scale pests has met with phenomenal success. Though something is known of the predaceous enemies of scales, comparatively little is known of the minute parasitic wasps that sometimes do a considerable amount of good work. The presence of these parasites can only be made out by the trained observer; a parasitized colony of scales will show minute holes on the scales which is the result of the emergence of the wasp which was inside the insect. A knowledge of the presence of these insects will help the gardener in deciding as to whether the application of any insecticide is necessary or not; the latter will not only be found unnecessary when the scales are found parasitized but the application will do harm by destroying the beneficial insects. Besides these insects there are certain species of lepidopterous larvæ (species of *Eublemma* in India) found doing some beneficial work as natural enemies in checking the multiplication of certain species of Coccids.

Classification of Coccidae.

The family is divided into a number of subfamilies as will be seen from the following pages. For all practical purposes, however, the family may be conveniently divided into two groups popularly known as "armoured" and "unarmoured" scales. The former are characterized by the possession of a protective scale which is hard and tough. Some of the forms included in this group are the worst enemies of

different kinds of cultivated plants, especially fruit trees, and very difficult to exterminate. The important genera are *Chionaspis*, *Aspidiotus*, *Diaspis*, *Mytilaspis* and *Purlatoria*. The unarmoured scales on the other hand include forms which are not so well protected, the body itself becoming more or less modified for protection; it is either soft and naked or is covered by waxy, cottony or glassy secretion. This group includes the soft scales, mealy-bugs, mealy scales, cottony bugs, etc. It is subdivided into several subfamilies, and the chief genera are *Pulvinaria*, *Lecanium*, *Pseudococcus* and *Icerya*.

Previous records of Coccids from South India.

The earliest record of a member of this family from South India appears to be that of the "Indian White Wax Insect"—*Ceroplastes ceriferus*, And.- by Dr. J. Anderson from Madras in the year 1790.¹ In his "Letters to Banks (1786-89)" Dr. Anderson has also recorded a few more forms of Coccids from the Madras Presidency, but his descriptions of them are so meagre as to be of no use to modern workers in recognizing the species referred to. For the next record we come down to 1886, in which year Atkinson published his paper on "The Homopteron family Coccidæ" in the *Journal of the Asiatic Society of Bengal*. In this paper the only definite species referred to as recorded from South India are *Ceroplastes ceriferus*, And., and *Monophlebous leachii*, West., the former from Madras and the latter from Malabar and Pondicherry. The later records of Coccids since then are to be found chiefly in the pages of *Indian Museum Notes*, a very valuable publication, now defunct, by various workers. In p. 59, Vol. II, No. 1, 1891, Maskell has described *Eriochiton cajani* from South India, and in page 168, No. 6 of the same volume are recorded *Lecanium viride* and *Dactylopius adonidum*. In Vol. III, No. 5, 1894, Professor Newstead has described some forms collected in Madras by Miss Tomlin in 1892-1893. These include the new forms *Pulvinaria obscura*, *Dactylopius ceriferus* (*virgatus*), *Dactylopius viridis*, *Aspidiotus orientalis*, *Icerya ægyptiacum* and *Lecanium hemisphæricum*. In 1895 Mr. E. E. Green described *Aspidiotus moorei*, from Madras, in the *Entomologist's Monthly Magazine* (Vol. VII). Again in Vol. IV of *Indian Museum Notes* (pp. 211-212) two South Indian forms are described, viz., *Diaspis calypteroides*, Costa, var. *cacti*, Comst., and a variety of the cochineal insect. To Vol. V, No. 1, Mr. Green contributes his remarks on Indian Coccidæ and gives a resumé of the previous records of Indian Coccidæ and in this no new forms other than those noted

¹ Anderson, J. "Monographia cocciceriferi," Madras, 1790.

above are recorded as South Indian. In part II of his paper which appeared in Vol. V, No. 3, of *Indian Museum Notes*, two new forms from South India are added, *Lecanium imbricans* and *Inglistia biraculata*. Part III of Mr. Green's paper appeared as a Memoir of the Department of Agriculture in India in 1908, and in this the author adds a dozen more new forms to the already recorded forms from South India. In the *Records of the Indian Museum*, Vol. VII, Part I, Mr. Green describes two or three species of *Mangrotes* from South India, and Lindinger in the pages of a German periodical¹ has recently (1911) described two species of *Mytilaspis* from South India.

So far as I know this concludes the previous records up to date. It is thus found from the above references that about forty species have been so far recorded from South India till now. As a result of my collection and some special attention paid to this group during the past two years, it has been possible to bring this number up to 129 so far as my collections have been worked out; and there is no doubt that more may be added when the remainder of my already collected material is gone through.² Nor is there any doubt that when all the tracts of the Presidency are thoroughly worked out, especially the hill tracts (most of the forms described in this paper are specimens from the plains), the number of species will increase enormously. I am very much indebted to Professor R. Newstead, F.R.S., and to Mr. E. E. Green, F.E.S., two of the foremost authorities on Coccidae, for their kindness in identifying the material submitted to them by me; and I am especially grateful to Mr. Green for the readiness with which he helped me from time to time and for his valuable suggestions with regard to the study of this group of insects.

Of the 129 species recorded in this paper, only 40 have been noted before from South India; of the rest, 18 are species new to science and all the others noted for the first time in this tract. Most of the new ones are being described in detail by Mr. Green, and will, I understand, be published soon. Among the new records several are quite new to India and some of them are pretty bad pests outside India. There is little doubt that at least a few of them are foreign forms and must have been introduced into India through nursery stock, fruits, seeds, bulbs, etc. In a paper³ read before the Indian Science Congress, Lahore, in January, 1918, on "Some South Indian Coccidae of Economic Importance," I have included 32 species which have so far been noted to be of some economic importance.

¹ *Zeitschrift. Wiss. Insektenbiol.*, VII, 1911.

² Unfortunately it is not possible in these days to get specimens identified from Europe, and so I have not been able to get all the material at my disposal determined.

³ Since published in the *Journal of the Bombay N. H. Society*, Vol. XXVI, page 621-628, 1919.

The great majority of the species noted below were collected in the Plains of South India, chiefly in and around the Coimbatore Agricultural College, and very little of the hills and the coast tracts has been explored. Though the great bulk of the material was collected by me I have had some help in the shape of material collected by the staff of the Government Entomologist's office and to them my thanks are due. I have added the names of the collectors in all those cases where I have not collected specimens of the species myself.

With regard to the arrangement of the forms, I have followed that of Green in his "Coccidæ of Ceylon."

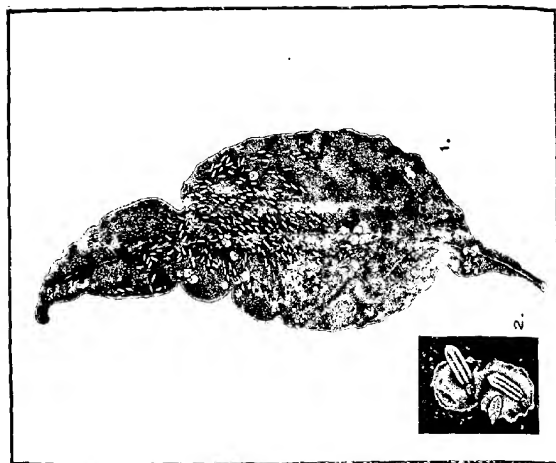


Fig. 3. *Chionaspis rosaeana*, Gravenhorst.
1) Puparium; 2) Female puparium, magnified.

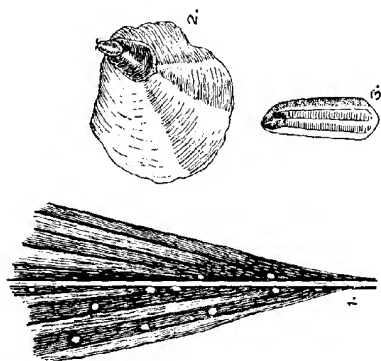


Fig. 2. *Chionaspis dilatata*, Gravenhorst.
1) Scales on pine; 2) Female puparium, magnified; 3) Male puparium, magnified.

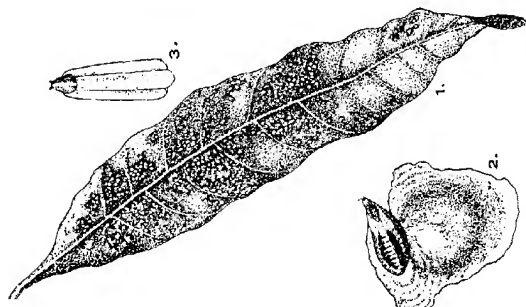


Fig. 1. *Chionaspis arctica*, Gravenhorst.
1) Puparium on spruce; 2) Female puparium, magnified; 3) Male puparium, magnified.

DIASPINE.

This subfamily includes what are known as "armoured scales". The armour or covering secreted by the insect is pretty hard and tough and as such these forms are not easy to destroy. The San Jose Scale, the Mussel Scale and other well-protected species belong to this sub-group. Ants do not generally visit colonies of these scale insects.

CHIONASPIS, Sign.

1. *Chionaspis vitis*, Green. (Pl. I, fig. 1.)

Chionaspis vitis, Green, I. M. N., IV, 1, 1896, p. 3.

Chionaspis vitis, Green, C. of C., Pt. II, 1899, p. 140, pl. XLVII.

Chionaspis vitis, Green, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 37.

Habitat. This insect is pretty common in South India. It chiefly attacks mango though it has been noted on *Elaeagnus latifolia* on the Nilgiris. It is very commonly found on mango in Bangalore, Kollegal and on the lower slopes of the Nilgiris, chiefly during the summer months. The infested plants show a discolouration of the leaf, the insect turning the natural green to a pale whitish yellow. The female puparia are white and irregularly oval with the pellicles yellowish; the male scales are small and elongate with the pellicle short and pale brownish.

Green has recorded it on *Vitis lanceolata* and also on *Loranthus* sp. in Ceylon. He observes in that connection that, "Should the grape-vine be ever cultivated largely in Ceylon, this insect might prove a rather serious pest." I have not noted it on grape yet.

2. *Chionaspis dilatata*, Green. (Pl. I, fig. 2.)

Chionaspis dilatata, Green, C. of C., Pt. II, 1899, p. 148, pl. LI.

Chionaspis dilatata, Green, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 36.

Phenacuspis dilatata, Cooley, Fern. Cat., p. 237 (the genus *Phenacuspis* was erected by Cooley and Cockerell, *Canadian Entomologist*, XXXV, p. 18).

Habitat. This insect was noted on young *Areca* palms in the Fern House at the Lal Bagh, Bangalore, in April, and on the leaf-sheaths of the palmyra palm in Godavari (December). Green remarks on specimens on palm leaf-sheath, "These are not typical examples; but

the differences are so small that I do not care to separate them specifically." The snow-white female puparia appear prominent though not in such crowded colonies as in the case of *C. citis*. The female scales are bright white with the pellicles reddish brown; the male puparium is not distinctly keeled as in *C. citis*. This is the first record of it in South India. Green records it from Calcutta on a species of palm. Known to infest mango, *Myristica moschata* and *Eurycles*. Noted on *Pandanus admiralisimus* in Australia. Reported to be very common on mango and *Ficus* in Poona.

3. *Chionaspis bicharis*, Comst.

Chionaspis bicharis, Comstock, Second Rept., Dept. Ento., Corn. Uni., 1883, p. 98.

Chionaspis bicharis, Green, I. M. N., IV, 1896, p. 2.

Hemaphysa bicharis, Ber. and Leon., Riv. Pat. Veg., IV, 1896, p. 348.

Chionaspis bicharis, Green, C. of C., Pt. II, 1899, p. 152, pl. LIV.

Chionaspis bicharis, Green and Mann, Mem. Dept. Agri., India, Ent. Ser., I, 1907, p. 551.

Chionaspis bicharis, Green, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 36.

Chionaspis bicharis, Newstead, Mon. Br. Cocc., I, 1901, p. 190, pl. XXI.

Chionaspis bicharis, Fletcher, Some South Indian Insects, 1911, p. 519, fig. 110.

Habitat. On the tea plant on the Nilgiris; first recorded by Green in 1908. Green remarks that this insect is perhaps "the most serious and widespread of all Coccide affecting the tea plant in Ceylon." It has not yet come to such prominence in South India. The species burrows into the bark and becomes more or less hidden; this is popularly called "the mining scale." The female scales are found concealed under the fibres of the bark of the host plant; males are unknown. It has been observed on cinchona, coffee and *Grevillea* in Ceylon, and on many other plants in other countries. I have not seen this insect.

4. *Chionaspis varicosa*, Green. (Pl. I, fig. 3.)

Chionaspis eugeniae, var. *varicosa*, Green, I. M. N., I, 1896, p. 2.

Chionaspis varicosa, Green, C. of C., Pt. II, p. 146, pl. L, 1899.

Phenacaspis varicosa—Generic name changed by Cooley, 1902.

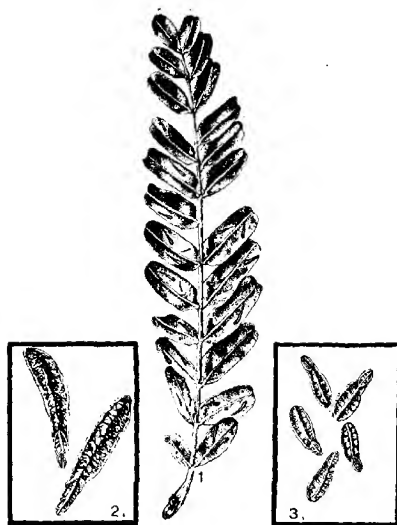
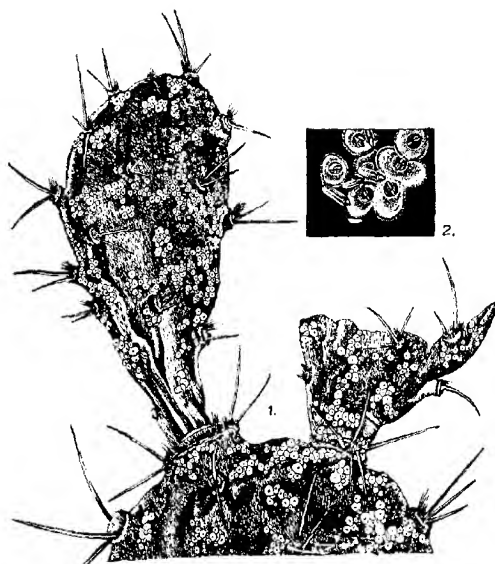


FIG. 4. *Chimoteopsis acuminata*, Green.
(1) Scales on tamarind leaves; (2) and (3) Puparia, magnified.



FIG. 6. *Flatidae plana*, Green M.
(1) Infested leaves of *Elaeagnus*.
(2) Scales magnified.



Habitat. On pepper stem, Sidapnr, Coorg (May). The female scales are bright white and roundish in shape. The species is very close to *C. bidavis*, differing only in its slightly longer form and in some minute details. It has not been recorded from India before. Green remarks that the puparium of the scale in the material I submitted to him is not typical, but the narrow form is probably consequent upon the position of the insect on the slender stem of the plant. Green found this on *Gelonium lanceolatum* in Ceylon.

5. *Chionaspis nilgiriæ*. Green MS.

Habitat. This insect is quite common on *Loranthus* on the Nilgiris at high elevations, 7,000-8,000 feet. Female puparia white, irregularly oval, pellicles yellowish, male scales small, white and tricarinate. Male scales are found crowded together in colonies. The leaves are often completely covered by the clear white male and female scales. *Loranthus*, parasitic on blue gum, *Litsea* and other trees at Ootacamund, are commonly found infested with this species. Badly-covered leaves are found in numbers on the ground below these trees.*

6. *Chionaspis spiculata*. Green MS.

Habitat. On bamboo leaf; Peria pass, Malabar.

7. *Chionaspis acuminata*. Green. (Pl. II, fig. 4.)

(C. of C. Pt. II, p. 136. 1899.)

Habitat. On *Ecdia*, Peria pass, Malabar. On *Bassia*, Madura.

C. acuminata, var. *atricolor*, Green.

Noted on *Curiga*, Coimbatore.

Species of *Chionaspis* have also been noted on *Morinda tinctoria* (Madras) and *Ficus* (Penukonda), but the specific determination has not been made due to insufficient material.

DINASPIIS, Leon.

8. *Dinaspis permutans*, Green.

Chionaspis permutans, Green, C. of C. II, p. 130. 1899.

Habitat. On *Erodia*, Peria pass, Malabar.

* Mr. Green has very recently written to me that this species is only *C. tricaricata*.
Gr.

DIASPIS, Costa.9. *Diaspis rosa*, Bouché.*Aspidiotus rosa*, Bouché, Naturg. Ins., p. 14 (1834).*Diaspis rosa*, Signoret, Ann. Soc. Ent., Fr., IX, 1869, p. 441.*Aulacaspis rosa*, Cockerell, Bull. Bot. Dept., Jamaica, 1896, p. 259.*Aulacaspis rosa*, Newstead, Mon. Br. Cocc., I, 1901, p. 168, pl. XIV.

Habitat. Found on mango leaves and on a wild undetermined plant in Bangalore, March-April. The female scales oval and cream white in colour with the exuvie dull yellowish. Not previously noted in India though recorded from Europe, America, China, Japan, and Australia on various fruit trees.

10. *Diaspis echinocacti*, Bouché. (Pl. II, fig. 5.)*Aspidiotus echinocacti*, Bouché, Schäd. Gart. Ins., p. 53 (1833).*Diaspis calyptroides*, Signoret, Ann. Soc. Ent., Fr., 1869, pp. 99 and 431.*Diaspis calyptroides*, Newstead, T. E. S., 1897, p. 94.*Diaspis calyptroides*, Newstead, Mon. Br. Cocc., 1901, p. 159, pl. XIII, XVI, and XVIII.*Diaspis calyptroides*, I. M. N., IV, 4, 1899, p. 211. See also Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 36.

Habitat. On prickly pear, Coimbatore and other places. This species was first noted in India from specimens sent from South India to the Indian Museum, Calcutta, and these were identified by Mr. Maskell. The species is very common in South India: sometimes the host plant is completely covered up by this insect. It does not, however, play any very effective part in checking the spread of the weed. The female scale is oval and greyish brown with a brown apex.

11. *Diaspis barberi*, Green.*Diaspis barberi*, Green, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 35.*Aulacaspis barberi*, Rutherford, Spol. Zeyl., X, 1915, p. 110.

Habitat. On *Loranthus*; Alamanda, Vizagapatam District. On mango; Hadagalli, Bellary. First described from specimens collected by Barber in Tanjore District. It differs slightly from *D. amygdali* of Green.

12. *Diaspis mangifera*, Green.

Habitat. On mango leaf ; Alamanda, Vizagapatam District. The female puparia are irregularly oval and have a pale greyish white colour ; the exuviae, of a dark brown colour. I am unable to find any previous reference to this species.

HEMICHIONASPIS. Kll.13. *Hemichionaspis dracæne*. Cooley.

Hemichionaspis dracæne, Cooley, Spec. Bull. Mass. Expt. Stn., 1899, p. 57.

Habitat. On Areca palm, Vadanapalle, South Malabar, in October. Young fronds are badly infested, the pale brown puparia being found in patches especially near the stalk and proximal portion of the leaf ribs. Not noted before in India. Described from Socotra.

14. *Hemichionaspis aspidistra*, Sign.

Chionaspis aspidistra, Signoret, Ann. Soc. Ent., Fr. (4), IX, 1869, p. 113.

Chionaspis aspidistra, Cotes, I. M. N., II, 1891 p. 17.

Chionaspis brasiliensis, Maskell, I. M. N., III, 5, 1894, p. 52.

Chionaspis aspidistra, Green, C. of C., Pt. II, 1899, p. 110, pl. XXXII.

Chionaspis aspidistra, Newstead, Mon. Br. Cocc., I, 1901, p. 187, pl. XX.

Hemichionaspis aspidistra, Cooley, Bull. Mass. Expt. Stn., 1899, p. 45.

Hemichionaspis aspidistra, Essig, Pom. Coll. Jour., 1909, p. 310.

Habitat. Found on Areca and jak in Mysore, on pepper berries and leaves in the Western Ghats, on Ceara rubber leaf on the Nilgiris, 2,000 feet, on coconut leaves in Malabar, on *Citrus* leaves in Godavari District, and on *Ficus* leaf in the Coimbatore and Godavari Districts. In some cases male scales are very numerous and prominent, while the female puparia are very few. These latter are long and narrow. The scale widens gradually from the anterior to the posterior end which is widest. The male scales are white in colour, while the female puparia have a pale yellowish to dark brown tinge. On pepper, the white scales predominate and often completely cover the berries like patches of lime. On the rubber leaf the female puparia were more commonly found. These light reddish brown female scales are found generally

on the back of the rubber leaves. This insect is a distinctly injurious species; though it has not assumed pest proportions there is every likelihood of this insect becoming serious as it affects numerous hot house and other plants. It has been noted on a variety of plants in different countries, and in Ceylon, Green records it on ferns, *Acacia*, mango, *Capparis*, *Croton* and many other plants. All the stages are found on *Ficus bengalensis* leaves in September at Kollegal, Coimbatore District. I have also noted a small black Chalcid as a parasite of this insect. A ladybird beetle, *Chilocorus circumdatus*, is said to be a natural enemy of this insect in Ceylon.

15. *Hemichionaspis minor*, Mask.

Chionaspis minor, Maskell, N. Z. Tr., XVII, 1884, p. 33.

Hemichionaspis minor, Cooley, Spec. Bull. Mass. Expt. Stn., 1899, p. 52.

Chionaspis albizziar, Green, C. of C., Pt. II, 1899, p. 115, pl. XXXIV.

Hemichionaspis minor, De Neville, I. M. N., V. 3, 1903, p. 128.

Hemichionaspis minor, Green, Mem. Dept. Agri., India, Ent. Ser., II, 1908 p. 39.

Hemichionaspis minor, Townsend, Jour. Ec. Enty., 1912, p. 256.

Habitat. Noted on the leaf-sheaths of *Agave* in Cuddappah, on leaves of *Cassia tora* and *Diospyros chloroxylon* in Bellary, and on leaf and fruit of tamarind in Coimbatore. The female puparia are brownish white in colour and in general form more or less similar to *H. aspidistra*. This is also an insect which is likely to become a pest in course of time, as it has been noted to be a destructive species in other countries. An infested young *Cassia* plant, with the exception of the tender shoots and leaves, is literally covered with the pale brown and white scales of this insect. Two wasps, *Prospaltella bedesii* and *Aphelinus diaspidis*, are parasitic on this scale in Ceylon. The ladybird beetle *Chilocorus nigrita*, Fab., is said to be predaceous on this insect in Calcutta, but I have not noted it as yet. This Coccid is known as the white scale (Pioja blanco) of cotton in Peru.

Recorded on cotton, pepper, coconut, etc., in other countries. It has been noted before on sann-hemp in Sibpur, Calcutta.

Mr. Green doubts whether the forms noted on tamarind and *Agave* sheath belong to this species. From one specimen I have recently collected on tamarind leaf at Coimbatore I am also led to believe that the tamarind ones may be a different species altogether. The female puparium looks quite different from *H. minor*.

16. *Hemichionaspis thea*, Mask.

Chionaspis thea, Maskell, I. M. N., II, 1891, p. 60, pl. I, fig. 2 a-c.

Chionaspis thea, Cotes, I. M. N., II, 6, 1893, p. 168.

Chionaspis thea, Cotes, I. M. N., III, 1, 1893, p. 25.

Chionaspis thea, Cotes, I. M. N., III, 4, 1895, p. 39.

Chionaspis exercitata, Green, I. M. N., IV, 1896, p. 3.

Chionaspis thea, Green, C. of C., Pt. II, 1899, p. 113, pl. XXXIII.

Chionaspis thea, Watt and Mann, Pests and Blights of Tea, 1903, p. 307.

Hemichionaspis thea, Cooley, Spec. Bull. Mass. Expt. Stn., 1899, p. 51.

Hemichionaspis thea, Green and Mann, Mem. Dept. Agri., India, Ent. Ser., I, 1907, p. 342; Fletcher, South Ind. Ins., pp. 520-521, f. 411.

Habitat. A few male puparia on pomegranate leaves found at Coimbatore and forwarded to Mr. Green were identified as probably belonging to this species. Female puparia long and narrow with sides more or less parallel; these are generally not very conspicuous. Male scales white and tricarinate. These latter are disposed in regular groups. So far, there is no definite record of its occurrence in South India, though Watt and Mann state that it is found in all tea districts in India. It is quite possible that it may be found to occur in the tea districts of South India, since it has been found on the Himalayas on one side and Ceylon on the other. This is not said to be a pest of any importance in South India. Recently I have come across specimens of male puparia on pepper and some wild plants on the Western Ghats, which by their general form and nice arrangement in groups appear to me to belong to this species.

17. *Hemichionaspis chionaspiformis*, Newst.

Diaspis (?) *chionaspiformis*, Newstead, Bull. Ent. Res., I, 3, 1910, p. 198.

Hemichionaspis chionaspiformis, Lindinger, Jahrb. Hamb. Wiss. Anst., 1910, p. 43.

Habitat. On wild indigo, Coimbatore. Recorded before from Africa; female puparia white with reddish yellow pellicles. Male scales small and white. No previous record from India.

FIORINIA, Targ.18. *Fiorinia plana*, Green MS. (Pl. II, fig. 6.)

Habitat. Noted on the leaves of *Elaeodendron glaucum*, Coimbatore and Courtallum (Tinnevely). The green leaves affected by the

insect show a yellowish brown dust-coated appearance. At a distance badly affected leaves show an ash-coated white appearance. Mr. Green is publishing the scientific description of the species separately. The insect is found on the tree throughout the year. It is allied to *F. similis*, Green.

ASPIDIOTUS, Bouché.

19. *Aspidiotus destructor*, Sign. (Fig. 7.)

Aspidiotus destructor, Signoret, Ann. Soc. Ent., Fr., 1869, p. 120.

Aspidiotus destructor, Maskell, I. M. N., III, 1, 1893, p. 66.

Aspidiotus destructor, Green, B. J., XIII, 1900, p. 70.

Aspidiotus destructor, Fletcher, South Ind. Ins., p. 518, f. 408.

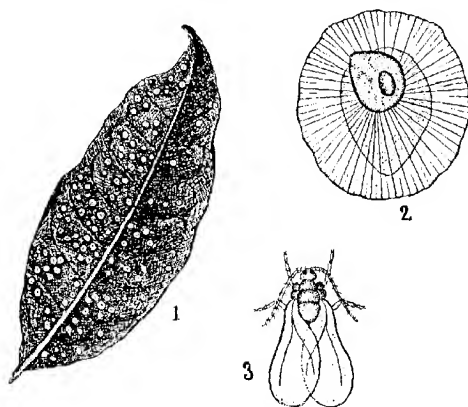


Fig. 7. *Aspidiotus destructor*, Sign.

(1) Scales on leaf, natural size; (2) Female, and (3) Male, both magnified.
(After Green.) (From *South Ind. Ins.*, fig. 408.)

Portions of Green's descriptions of the two species *A. lataniae* and *A. transparentis* in his "Coccidæ of Ceylon" refer to this species.

Habitat. Found on coconut all over the West Coast, Tinnevely, Coimbatore and Anantapur. Noted on *Eugenia* in the Mysore uplands. It was first noted on coconut from the Laccadives in 1891. The puparia are semi-transparent, yellowish, irregularly circular, and are found in large patches on infested fronds. Kasergode and Burkill record this on mango in Bombay. It has been

recorded also on tea, pepper, Ceara rubber, plantain leaf, *L. randhas*, etc., in Ceylon. Sometimes the insect causes appreciable damage to the coconut palm. The species has a very wide distribution, being found in China, Australia, Mexico, West Indies, etc.

20. *Aspidiotus orientalis*. Newst.

Aspidiotus orientalis, Newstead, I. M. N., III, 5, 1894, p. 26.

Aspidiotus osbeckia, Green, I. M. N., IV, 1896, p. 4.

Aspidiotus osbeckia, Green, C. of C., Pt. I, 1896, p. 47, pl. VII.

Aspidiotus orientalis, Green, B. J., XIII, 1900, p. 69.

Aspidiotus orientalis, Rutherford, Spol. Zeyl., X, 1915, p. 106.

This species was first described by Professor Newstead from specimens collected by Miss Tomlin at Seven Pagodas near Madras in 1892. The food-plant on which it was found is not stated. This insect is very commonly found on a variety of plants in South India. The puparia are compact and oval, varying in colour from light to reddish brown; the central pellicles are reddish; the male scales are oblong. On tamarind fruits the scales are found in enormous numbers in patches covering the whole fruit and giving it a sickly corrugated appearance. It has been so far noted on castor, *Solanum*, *Tephrosia*, *Cassia*, *Polyalthia*, plantain leaf, *Calotropis*, tamarind, *Chlorocylon srieteuia*, mahogany, *Carissa*, etc. It is recorded on banana leaves and on leaves and fruits of papaya in Australia, on *Azylus candollei* and *Osbeckia* in Ceylon and on rose plant in Bombay.

21. *Aspidiotus latania*. Sign.

Aspidiotus latania, Signoret, Ann. Soc. Ent., Fr., 1869, p. 124.

Aspidiotus latania, Green, B. J., XIII, 1900, p. 69.

Aspidiotus latania, Green, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 33.

Green states that his *cylaniæ* recorded in his C. of C. is the true *latania*. Sign.

Habitat. Noted on sisal hemp and *Carissa carandas* in Coimbatore and on *Nerium oleander* in Madras. The female puparia are strongly convex and circular: pale brown in colour. It has been recorded before on peach in Coonoor and *Phayis* in Calcutta. In Bombay it is noted on *Citrus*, bamboo and *Poinciana regia*.

22. *Aspidiotus rossi*, Mask.

- Aspidiotus rossi*, Maskell, N. Z. Transactions, XXIII, 1890, p. 3.
Aspidiotus rossi, Green, C. of C., Pt. I, 1896, p. 45, pl. VI.
Chrysomphalus rossi, Leonardi, Riv. Pet. Veg., VII, 1899, p. 202.
Chrysomphalus rossi, Rutherford. Spol. Zeyl., X, 1915, p. 107.

Habitat. Found on mango leaves, Cocanada, and on *Carissa carandas* leaves in Coimbatore. Not very common. The puparia are oval in shape and are dark brown in colour, the central region being almost black. Noted on *Barringtonia acutangula* at Poona by Kaserode. Found on *Cycas* sp. and on *Capparis* in Ceylon. The original home of this species appears to be Australia, where it is very common and affects a variety of plants.

23. *Aspidiotus cyanophylli*, Sign.

- Aspidiotus cyanophylli*, Signoret, Ann. Soc. Ent., Fr., IX, 1869, p. 119.
Aspidiotus cyanophylli, Newstead, Mon. Br. Cocc., I, 1901, p. 124, pl. IX.
Aspidiotus cyanophylli, Green, C. of C., p. 51, pl. IX.

Habitat. On plantain leaf and Ceara rubber, Nilgiris, 2,000 feet. Female puparia pale yellowish and transparent, oblong or roughly oval in shape. Not recorded before from India. Green records it on tea, a species of palm, and cinchona in Ceylon. Noted on plantain (*Musa*) in Fiji. (See *Bull. Ent. Res.*, V, 1, p. 44, 1916). It is recorded on coconut husk in Zanzibar.

24. *Aspidiotus camelliae*, Sign. (Fig. 8.)

- Aspidiotus camelliae*, Signoret, Ann. Soc. Ent., Fr., IX, 1869, p. 117.
Aspidiotus flarescens, Green, I. M. N., II, 6, 1893, p. 168.
Aspidiotus flarescens, Green, I. M. N., III, 4, 1895, p. 41.
Diaspis circulata, Green, I. M. N., IV, 1, 1896, p. 4.
Aspidiotus camelliae, Green, C. of C., Pt. I, 1896, p. 60, pl. XIII.
Aspidiotus camelliae, Green, B. J., XIII, 1900, p. 71.
Aspidiotus camelliae, Watt and Mann, Pests and Blights of Tea, 1903, p. 303.
Aspidiotus camelliae, Green and Mann, Mem. Dept. Agri., India, Ent. Ser., I, 1907, pp. 343 and 353.
Aspidiotus camelliae, Newstead, Mon. Br. Cocc., I, 1900, p. 91.
Aspidiotus camelliae, Newstead, Bull. Ent. Res., VII, 1917, p. 371.
Aspidiotus camelliae, Fletcher South Ind. Ins., pp. 517-518, f. 407.

PLATE III.

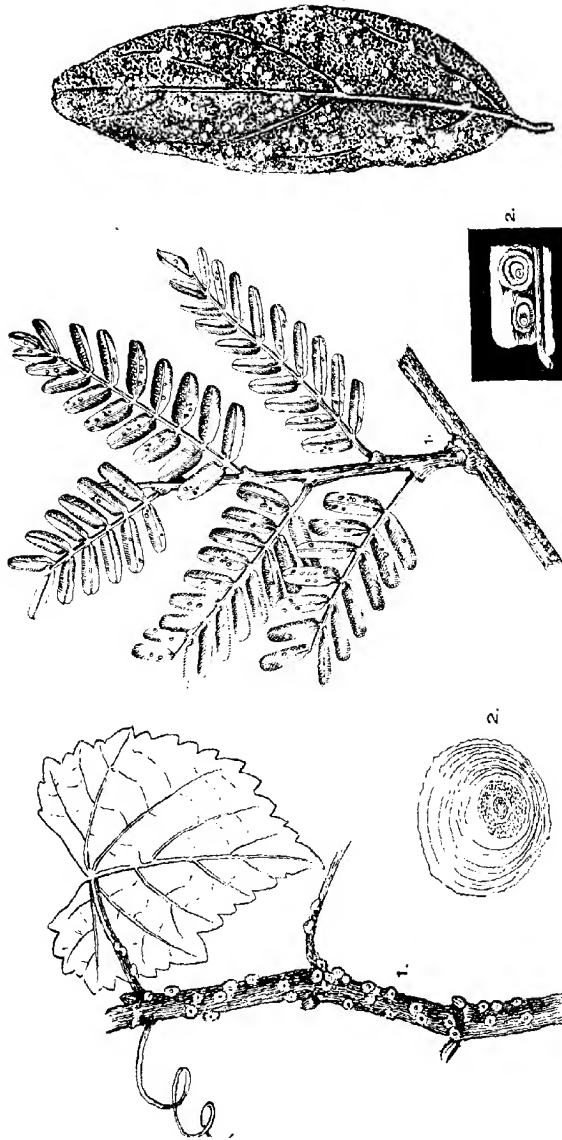


FIG. 11. *Aspidiotus pseudocorymbosus*, Green M.S., no. 11, 1892.

FIG. 10. *Aspidiotus tamaricifera*, Green M.S., no. 10, 1892.

FIG. 9. *Aspidiotus cytharidis*, Const., no. 9, 1892.

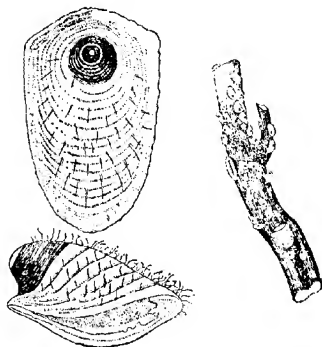


Fig. 8. *Aspidiotus canellier*, Sign.

Scales, natural size, on branch, and two scales, magnified, seen from above and from the side, (After Green.) (From *South Ind. Insects*, fig. 407.)

Habitat. On tea in the Nilgiris. It was also found bad on a young English elm tree in the Ootacamund Botanical Gardens and also on a species of *Ficus* at Dodabetta, 7,500 feet; May 1917.

This is called "the yellow bark louse" of tea; is also called "the greedy" scale in other countries. The puparia greyish white in colour, oval and strongly convex, each looking like a limpet in shape. Sometimes found crowded together in patches. Recorded also as common on *Grevillea*, *Cinchona*, and *Michelia* in Ceylon.

25. *Aspidiotus cydonia*, Comst. (Pl. III, fig. 9.)

Aspidiotus cydonia, Comstock, Rept. U. S. Dept. Agri., 1880, p. 295.

[*Aspidiotus cydonia* of Green in his *Coccidæ of Ceylon*, p. 62 (1896), is not that species (See B. J., XIII, 1900, p. 71).]

Habitat. Found on grape, fig, and pear plants at Bangalore and Coimbatore.

The scales are small and circular having a pale brown colouring; found in patches at the nodes of grape-vines and on the stalks of fig and pear fruits and shoots. Likely to become a pest and appears to have been introduced with fruit and nursery stock. This is the first record from India.

26. *Aspidiotus dictyospermi*, Morg.

Aspidiotus dictyospermi, Morgan, Ent. Mon. Mag., XXV, 1889, p. 352.

Aspidiotus dictyospermi, Barlow, I. M. N., IV, 1899, p. 119.

Chrysomphalus dictyospermi, Leonardi, Riv. Pat. Veg., VII, 1899, p. 218.

Aspidiotus dictyospermi, Green, B. J., XIII, 1900, p. 68.

Aspidiotus dictyospermi, Green, B. J., XVI, 1905, p. 345.

Habitat. On *Dendrobium* (Bangalore). The succulent parts of this orchid were found thickly covered by this insect. On *Minusops elengi* (Cocanada). The flat reddish brown scales are easily made out. Noted before on *Cycas*, *Opuntia*, and *Calophyllum* in Ceylon. Noted on tea in North India. Recorded on rose bushes in Uganda (see *Bull. Ent. Res.*, VII, 1917, p. 271).

27. *Aspidiotus tamarindus*, Green MS. (Pl. III, fig. 10.)

Habitat. On tamarind leaf and fruit (Combatore).

The scales are found in company with *Hemichionaspis muna*, Mask. The technical description of this new species is being published by Mr. Green. It is closely allied to *A. holeric*, Vall., but differs in the large third lobe.

28. *Aspidiotus pseudocanehellæ*, Green MS. (Pl. III, fig. 11.)

Habitat. On *Capparis*: Ittigi, Bellary District. The greyish oval scales are found in depressions on the leaf surface. The plant appears to suffer badly from the infestation.

29. *Aspidiotus moorei*, Green.

Aspidiotus moorei, Green, Ent. Mon. Mag., 1896, p. 199.

Targionia moorei, Leonardi, 1900.

Aspidiotus moorei, Green, I. M. N., V, 1900, p. 2.

The species was first described by Mr. Green from specimens got from Madras in 1896. Found on *Gristia tomentosa*. I have not seen specimens of this species.

30. *Aspidiotus aurantii*, Mask. (Pl. IV, fig. 12.)

Aspidiotus aurantii, Maskell, N. Z. Tr., XI, 1878, p. 199.

Aspidiotus aurantii, Green, C. of C., Pt. I, 1896, p. 58, pl. XII.

Aspidiotus aurantii, Green, I. M. N., V, 1, 1900, p. 2.

Chrysomphalus aurantii, Cockerell, Check List Suppl., 1899, p. 396.

Aspidiotus aurantii, Green, B. J., XIII, 1900, p. 71.

Aspidiotus aurantii, Newstead, Mon. Br. Cocc., I, 1901, p. 68, pl. I.

Reference will also be found in numerous American publications in Entomology.

This is the notorious "red scale" of *Citrus* trees in America and other countries.

PLATE IV.

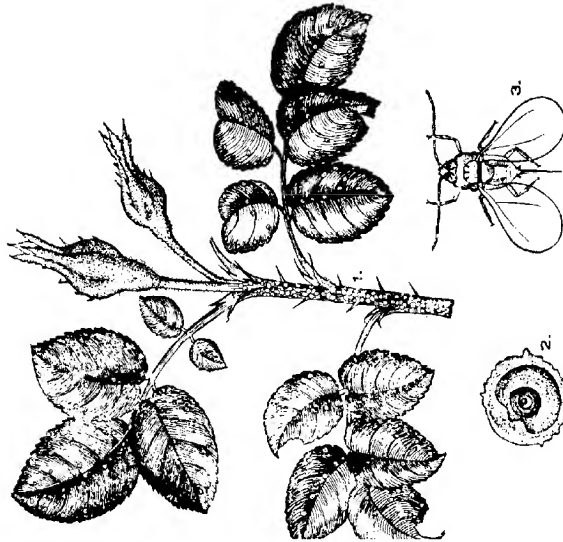


Fig. 12. *Aspidiotus rosae* Mask.

(1) Scales on rose-shoot; (2) Female puparium, magnified;
(3) Adult male, magnified.

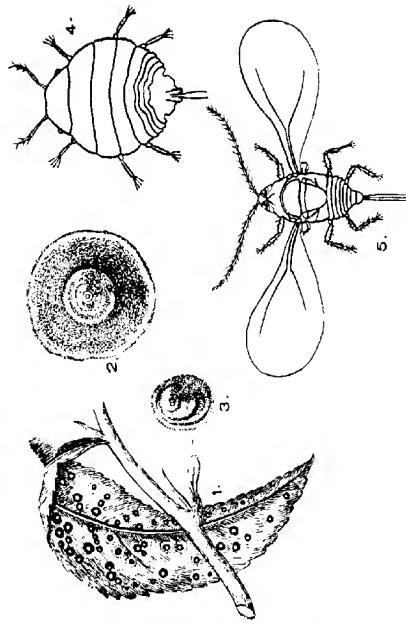


Fig. 13. *Aspidiotus florea*, Ashmead.

(1) Scales on orange leaf; (2) Female scale; (3) Male scale; (4) Larva, and
(5) Adult male, all magnified. Fig. from *Indian Museum Notices*.

PLATE V.

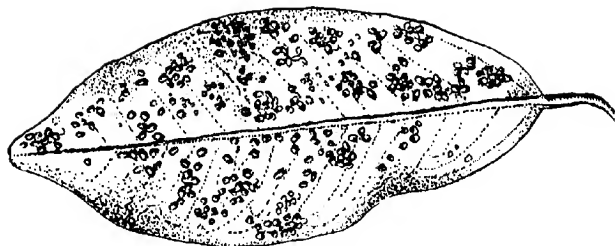


FIG. 14. *Leucaena glauca*, Green, Case in M. S.

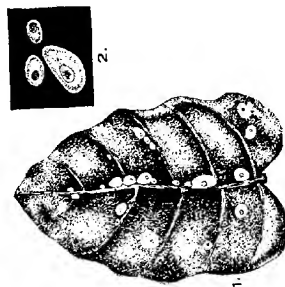


FIG. 15. *Leucaena* (*Pseudotsuga*)
trilobifrons, Green.
(1) Scabs on *Leuca* leaf; (2) Scabs,
magnified.

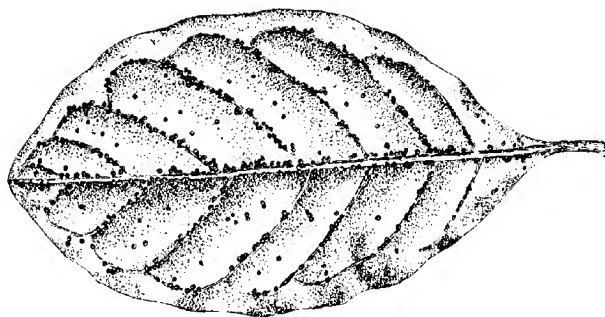


FIG. 16. *Leucaena* (*Pseudotsuga*) *trilobifrons*, Green, Case in M. S.

Habitat. On rose bush, badly covering leaves and stem. Palghat, Malabar; Jasmine leaves, Someshwarum, Godavari District. Noted before on rose bushes in North India. I have not seen it yet on a *Citrus* plant in South India, but it is quite likely to be found. Mr. Green has recorded it on *Agave*, pomelo and oranges in Ceylon. This is one of those insects against which *Citrus* cultivators have to be on the guard.

31. *Aspidiotus ficus*, Ashmead. (Pl. IV, fig. 13.)

Chrysomphalus ficus, Ashmead, Amer. Ent., III, 1880, p. 267.

Aspidiotus ficus, Comstock, Rept. U. S. A. Dept. Agri., X, 1881, p. 296.

Aspidiotus ficus, Barlow, I. M. N., IV, 2, 1896, p. 69.

Chrysomphalus aonidium, Cockerell, Biol. Centr. Amer., Pt. II, 1899, p. 25.

Aspidiotus ficus, Green, B. J., XIII, 1900, p. 69.

Aspidiotus ficus, Newstead, Mon. Br. Cocc., Pt. I, 1901, p. 101, pl. I.

Aspidiotus ficus, Green, C. of C., Pt. I, 1896, p. 13, pl. V.

Aspidiotus ficus, Green, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 33.

This is also a well-known insect and cosmopolitan in distribution; recorded on a variety of plants.

Habitat. On *Ficus* (Penukonda, Anantapur District); mango (Coimbatore); *Citrus* leaf (South Malabar and Nilgiris); *Pandanus* (Cochin Coast); and *Eugenia* and *Citrus* (Maddur, Mysore). Noted before from Calcutta on *Phoenix*, and on Areca and orange from Bombay. In Ceylon, Green records it on *Rhododendron arboreum*. It has recently been noted on coconut in S. Kanara. The scales are dark purplish brown in colour with the pellicles reddish.

32. *Aspidiotus triglandulosus*, Green. (Pl. V, fig. 14.)

Aspidiotus (*Chrysomphalus*) *triglandulosus*, Green, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 33.

This species was first described by Mr. Green from specimens collected at Mahabaleswar, Bombay, on an undetermined tree.

Habitat. On jak leaf, Bangalore. (Fletcher coll.)

The minute bluish-black scales are found regularly arranged along the leafribs on both sides of the leaf and its stalk.

33. *Aspidiotus trilobitiformis*, Green. (Pl. V, fig. 15.)

Aspidiotus trilobitiformis, Green, I. M. N., IV, 1, 1896, p. 11.

Aspidiotus trilobitiformis, Green, C. of C., Pt. I, 1896, p. 41, pl. IV.

Aspidiotus trilobitiformis, Green, B. J., XIII, 1900, p. 66.

Pseudoaonidia trilobitiformis, Cockerell, A. M. N. H., IX, 1902, p. 456.

Pseudaonidia trilobitiformis, Rutherford, Spol. Zeyl., X, 1915, p. 108.

Habitat. On *Ixora*, Vadanapalle (South Malabar); on *Mimusops elengi* (Cocanada), on mango (Coimbatore). Noted in Ceylon on *Dalbergia championii* and *Ixora coccinea*, but the ordinary food-plant in Ceylon, according to Green, appears to be *Nothopegia colebrookiana*. Noted on oleander in Africa (Neave). The female puparium is flattish oval and of a pale reddish brown colour. On *Ixora* the scales are generally found clustering along the mid-rib of the leaf. Not noted before in India.

ODONASPIS, Cockerell.

34. *Odonaspis simplex*, Green.

Chionaspis simplex, Green, C. of C., Pt. II, p. 160, 1899.

Habitat. On bamboo stem, Coimbatore. New to India.

35. *Odonaspis penicillata* Green.

Odonaspis penicillata, Green, B. J., XVI, 1907, p. 346.

Froggatiella penicillata, Rutherford, Spol. Zeyl., X, 1915, p. 101.

Habitat. On bamboo - *Ochlandra travancorica* - Coimbatore. The scales are found at the nodes amongst the plant hairs at that point. The pale brown scales edged with white are generally found protected by the hairs and the small leaf-sheaths at the nodes. First recorded by Green from Ceylon on giant bamboo *Gigantochloa aspera*. New to India.

AONIDIA, Targ.

36. *Aonidia viridis*, Lind.

Aonidia viridis, Lindinger, Zeit. f. wiss. Insekbiol., 1911, p. 66.

Habitat. On *Aglaia* (Travancore). This is a recent record by Lindinger. I have not seen the form myself.

37. *Aonidia tentaculata*, Green MS.

Habitat. On *Vateria indica*, Quilon, Travancore.

GYMNASPIS, Newst.

38. *Gymnaspis ficus*, Green MS. (Pl. V, fig. 16.)

Habitat. On leaves of *Ficus retusa*, Kollegal (Coimbatore, 1,600 feet). The scales are obscure and appear as small pale grey to green roundish dots on the leaf surface: not easily made out on the leaf when casually observed: but infested leaves present a rough pale dusty appearance.

39. *Gymnaspis ramakrishnæ*, Green MS.

Habitat. On *Hemigysa scanascens*, Courtallum, Tinnevely.

MYTILASPIS, Sign. (*LEPIDOSAPHES* Shimer.)

40. *Mytilaspis piperis*, Green. (Fig. 17.)

(Mem. Dept. Agri. India, Ent. Ser., II, 1908, p. 34; Fletcher.

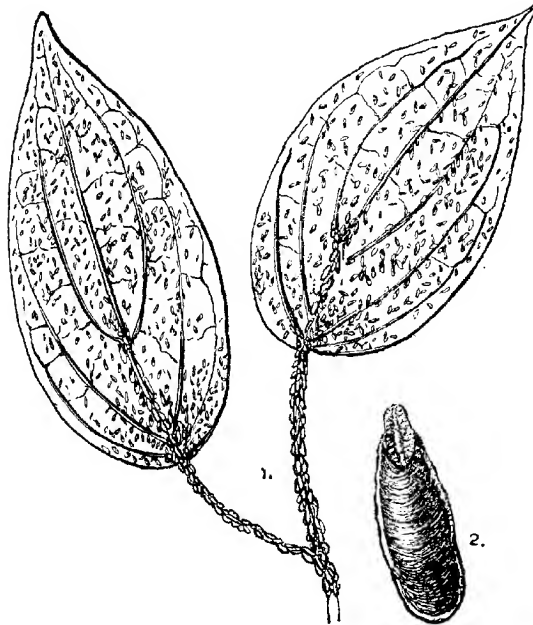


Fig. 17. *Mytilaspis piperis*, Green.
(1) Scales on pepper plant; (2) Female puparium, magnified.

Habitat. Pepper leaves and stem, Western Ghats. First described by Green from specimens collected by C. A. Barber in North Malabar. The pepper plant sometimes appears to suffer badly from this pest. The whole surface of the tender shoots and the stems is fringed with these long narrow scales closely overlapping one over the other. A badly infested stem generally fades and dries up. A scale infested vine is not easily made out as the colour and general appearance resemble almost exactly the corrugated rough surface of a healthy stem. Green places this species as an intermediate form between *citricola* and *gloriosi*.

41. *Mytilaspis* (*Lepidosaphes*) *beckii*, New-t.

Aspidiotus citricola, Packard, Guide to Study of Insects. 1869, p. 527.

Mytilaspis citricola, Comstock, U. S. A. Agr. Rept., 1880, p. 321.

Mytilaspis beckii, Cockerell, Proc. Ac. N. Sc. Phil., 1899, p. 275.

Mytilaspis pinnariformis, Newstead, Mon. Br. Cocc., I, p. 204, 1901.

Habitat. On pepper leaf (Trivandrum). Collected by my brother Subramania Ayyar and identified by Professor Newstead. This insect which is known as the "purple scale" has a world-wide distribution and attacks various kinds of fruit trees besides other plants. Noted by Green on *Citrus* fruits and *Toddalia aculeata* in Ceylon. Not recorded before from India.

42. *Mytilaspis (Lepidosaphes) trancorensis*, Lindinger.

(Zt. f. wiss. Insektenbiol., VII, 4, 1911, p. 127.)

Habitat. Recorded on undersurface of *Aglaia* leaf by Lindinger. I have not seen this form.

43. *Mytilaspis retrusus*, Green MS. (Pl. VI, fig. 18.)

Habitat. On *Litsea whitiana*, Dodabetta, Nilgiris, 8,000 feet. The scales are dirty brown in colour and are found fringed in numbers along the veins of the leaf which they very closely resemble in colour; found chiefly on the lower surface of the leaves.

44. *Mytilaspis ? pallida*, Green.

Mytilaspis pallida, Green, I. M. N., IV, 1896, p. 5.

Mytilaspis glomeri, Paek., var. *pallida*, Green, C. of C., 1896, p. 85, pl. XXIII.

Habitat. On guava leaf, Ramachandrapur, Godavari District, December. Only a few isolated scales were found on a leaf. Mr. Green has determined simply from one or two scales submitted to him with a query. First record from India.

45. *Mytilaspis (Lepidosaphes) melia*, Green MS. (Pl. VI, fig. 19.)

Habitat. On stem and shoots of Nim tree (*Melia azadirachta*) Coimbatore.

Bad on isolated young plants.

PARLATORIA, Targ.

46. *Parlatoria (Euparlatoria) orientalis*, Newstead MS.

Described by Professor Newstead from specimens I collected in 1909 on a wild bush, Coimbatore, September. The greenish-white scales are found crowded on the small twigs of the plant.

47. *Parlatoria proteus*, Curtis. (Fig. 20.)

Aspidiotus proteus, Curtis, Gard. Chron., 1843, p. 676.

Parlatoria proteus, Signoret, Ann. Soc. Ent., Fr., 1869, p. 450.

PLATE VI.

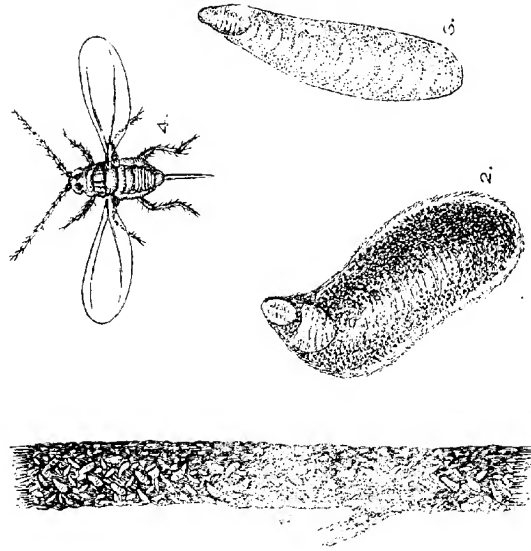


FIG. 19. *Lepidosaphes ulmi*, Green M.S.
 (1) Scales on *Milia* stem; (2) Full-grown female, magnified; (3) Male, magnified; (4) Winged male; (5) Winged male.

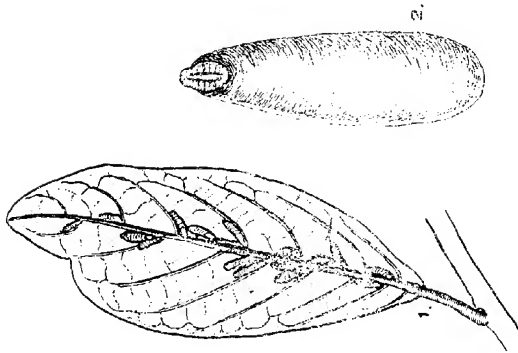


FIG. 18. *Mallophaga ulmi*, Green M.S.
 (1) Scales on *Litsea* leaf; (2) Female scale, magnified.

Parlatoria proteus, Newstead, Mon. Br. Cocc., Pt. I, 1901, p. 140
pl. XXX.

Parlatoria proteus, Green, B. J., XVI, 1905, p. 349.

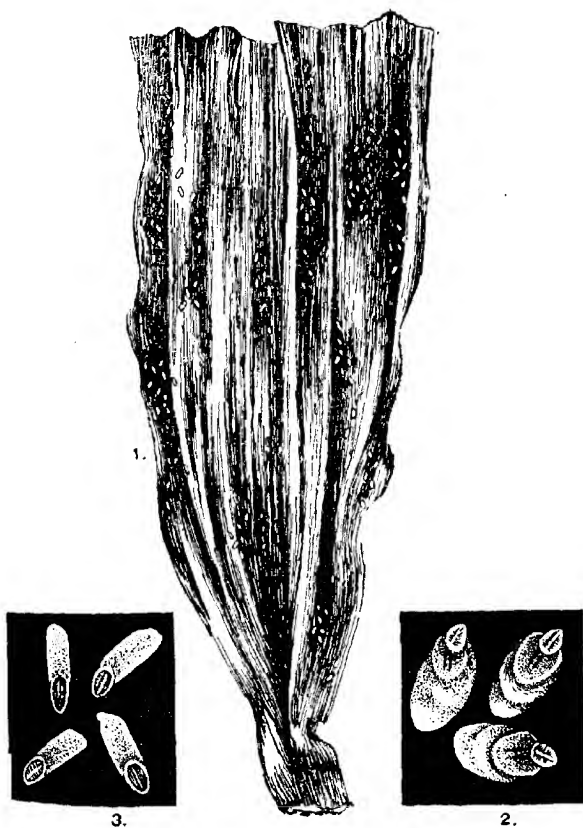


Fig. 20. *Parlatoria proteus*, Curtis.
(1) Scales on orchid; (2) Female scales, magnified; (3) Male scales, magnified.

Habitat. On species of orchids—*Vanda* and *Bellatulum*—Lalbagh, Bangalore. The puparia are oval and long and of a dull pale brown colour and found crowded on the leaves of these orchids. This is the first record of the insect in India and it is perhaps an imported form.

48. *Parlatoria pergandii*, Comst.

Parlatoria pergandii, Comstock. U. S. A. Rep., p. 327, 1881.

Parlatoria pergandii, Newstead, Mon. Br. Cocc., I, p. 113, 1901.

Habitat. On garden *Crotoms*; Peria pass, Malabar.

49. *Parlatoria artocarpæ*, Green MS.

Habitat. On jak leaf; Peria pass, Malabar.

50. *Parlatoria (Websteriella) papillosa*, Green MS.

Habitat. On jak leaf; Palghat, S. Malabar.

51. *Parlatoria calianthina*, Ber. and Leon.

(Rev. Pat. Veg., III, 1895, p. 346.)

Habitat. The tender leaves, shoots and stems of the garden oleander (*Nerium*). Madras. Once noted before by Lindinger from North India in 1911 (see p. 129 of *Zt. f. wiss. Insekt.*). The insect is found in dirty brown masses on the leaves and shoots in company with colonies of *Aspidiotus lauræ*.

This is a native of Italy and attacks fruit trees like peach, apple, almond and olive.

I noted this pest only in Madras and though I have examined hundreds of oleander plants in other places I have not yet seen it outside Madras.

52. *Parlatoria (Websteriella) vateriæ*, Green MS.

Habitat. On *Vateria indica*; Quilon, Travancore.

53. *Parlatoria (Websteriella) ziziphus*, Lucas.

Coccus ziziphus, Lucas, Bull. Soc. Ent., Fr., 1853, p. 28.

Parlatoria ziziphus, Signoret, Ann. Soc. Ent., Fr., 1869, p. 451.

Parlatoria ziziphus, Newstead, Mon. Br. Cocc., Pt. I, 1901, p. 143, pl. XXX and XXXIII.

Parlatoria ziziphus, Green, J. M. N., V, 3, 1903, p. 102.

Habitat. On *Citrus* leaves, Coimbatore. The scales are oblong in shape and opaque black with a narrow rim of pale white secretion at the edges. It appears as small black dots on the leaf.

Green records it on *Citrus*; Ballygunge, Calcutta.

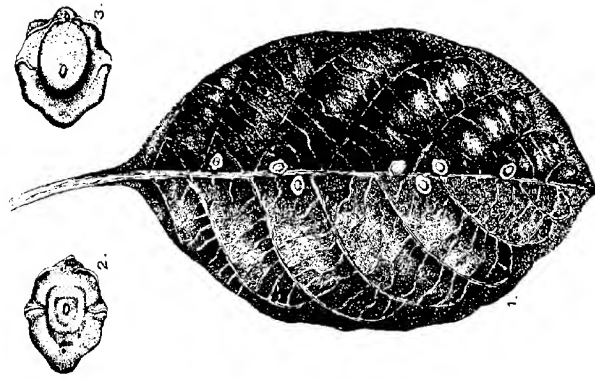


Fig. 221. *Cyrtopeltis andreae*, Musk.
2) Spot on oak leaf; 3) spot on oak leaf, same as female.

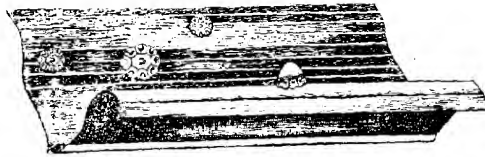


Fig. 222. *Cyrtopeltis andreae*, Musk.
Detailed view of the leaf, showing the central part, magnified.



Fig. 223. *Puccinia pridis*, Musk.
1) Branch heavily showing colonies of the insect; 2) Female, not mature; 3) Adult female, with ova.

54. *Parlatoria mangifera*. Marlatt.

(Bull. U. S. Bur. Ent., t.s. 16, Pt. II, 1908, p. 28.)

Habita. Found in thick masses on palmyra leaf-sheath, Godavari District. The female puparia are oval and greyish brown with the larval pellicle greenish.

Not recorded before from India. The species was first described by Marlatt in America from specimens received there, as found on mango in Singapore.

55. *Parlatorium* species (*inceda sedis*), Lindinger.

Habita. On *Shorea tumburghia* from Cuddapah by Lindinger (vide *Zt. f. wiss. Insect.*, 1911, p. 130).

LECANIINÆ.

The forms included in this and the following sub-families are what are called unarmed scales, where the body is soft and naked or covered over by waxy, cottony or glassy secretion.

PULVINARIA, Targ.56. *Pulvinaria psidii*, Mask. (Pl. VII, fig. 21.)

Pulvinaria psidii, Maskell, N. Z. Tr., XXV, 1892, p. 223.

Pulvinaria psidii, Green, I. M. N., IV, 1, 1896, p. 8.

Pulvinaria psidii, Green, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 32.

Pulvinaria psidii, Green, C. of C., Pt. IV, 1909, p. 261, pl.

Pulvinaria psidii, Fletcher, South Ind. Ins., pp. 510—512, fig. 399.

This is one of the commonest and destructive scale insects of South India. It feeds on a variety of food-plants, the chief of them being guava, mango, *Moriinda*, tea and coffee. On guava it is very bad in Coimbatore. Badly infested plants become completely blighted with a dark sooty mould, the leaves showing a glistening sticky appearance due to the sweet secretion produced by these insects. During the early stages and until the female begins to oviposit the insect has a more or less bright green colour and may be mistaken for a green species of *Lecanium*, but after oviposition a long cottony sac is thrown out from behind the female and these white ovisacs proclaim the presence of the pest in badly infested plants. In the planting districts this is very common and is known as "the mealy scale" of coffee and tea*. In the plains, the guava and *Moriinda* plants suffer very badly from the attacks of this insect.

* It is wrong to call it a mealy-bug.

57. *Paluinaria marina*, Green. (Pl. VIII.)

(Ent. Mon. Mag. XL, 1904, p. 206.)

Habitat. Very common on Nim (*Melia*) trees in Coimbatore. Sometimes it does considerable damage to young trees. The leathery pale brown adult females cover the tender shoots and stem in numbers, and the small white male scales are generally found conspicuously on the leaves. The ovisacs are prominent and comparatively very long. The ground below badly infested branches of Nim trees becomes wet with secretion. The common black ant *Camponotus compressus* visits the scales in numbers.

The insect was first described by Mr. Green from Javanese specimens collected on *Erythrina lithosperma*. He speaks of this insect as the giant of its kind. So far in South India it has confined its attacks chiefly to Nim, but judging from its destructive nature it is not unlikely that it may attack other valuable shade and fruit trees. It has latterly been found on mulberry plants and also on cotton to a small extent in Palur, S. Arcot. Two or three persistent washes with fish oil soap or kerosine emulsion check the pest. A few parasites are found on this insect.

58. *Paluinaria thespesia*, Green.

(C. of C., IV, 1900, p. 259, pl. XC VII.)

Habitat. On *Thespesia populnea* in Coringa (Godavari District) and in Tanjore.

The long curved egg sacs of this insect are very prominent and sometimes cover the foliage profusely. The insect is very much like *Paluinaria marina*, and Green who determined the species doubts whether it is really distinct from *Paluinaria marina*. This is the first record of the insect in India, Green having described the species for the first time from Ceylon on the same food-plant. The just-hatched larva has a violet brown colour and has two very slender processes at the tail end.

59. *Paluinaria buckleyi*, Green

(Mem. Dept. Agri. India, Ent. Ser., (I, 1908, p. 31.)

Habitat. On shoots of *Zizyphus jujuba*, Coimbatore. (Fletcher coll.)

60. *Paluinaria obscura*, Newstead.

(I. M. N., III, 5 1894, p. 23.)

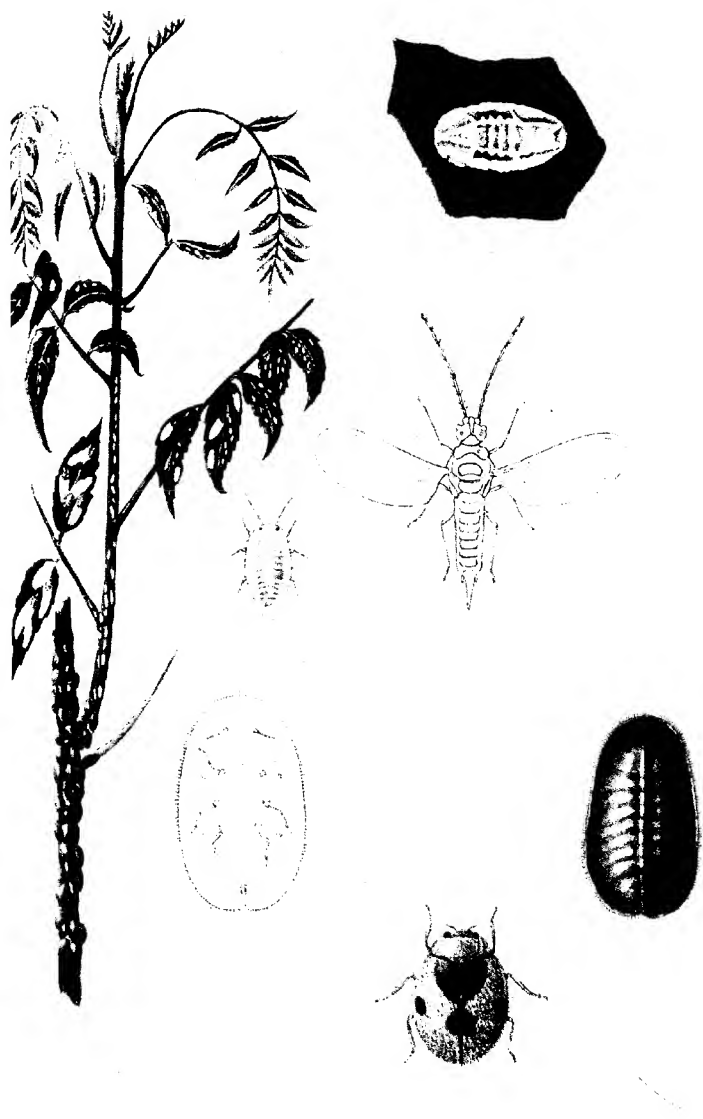
Habitat. Described by Newstead from specimens on *Hygrophila spinosa*, Nungumbakam, Madras.

Collected by Miss Tomlin in 1892.

EXPLANATION OF PLATE VIII.

Pulvinaria maxima, Green.

1. Scale infested *elm* branch (reduced to $\frac{2}{3}$ of natural size).
2. Adult female mounted on slide, $\times 7$.
3. Adult female from nature, $\times 7$.
4. Male puparium on leaf, $\times 14$.
5. Young active larva, $\times 20$.
6. Adult male, $\times 20$.
7. Predaceous Coccinellid beetle, $\times 20$.



PULVINARIA MAXIMA. GREEN.

Pulvinaria spp.

I have also got imperfect and undetermined material of *Pulvinaria* collected on *Lantana* (Saidapet, Madras), *Myrabilis* (Coimbatore), grapevine (Salem District), *Strychnos nuxvomica* (Cuddapah District), etc. These will have to be specifically determined in course of time.

CEROPLASTES, Gray.

The species of this genera are known as "Wax scales" due to the soft waxy secretion covering the insects.

61. *Ceroplastes ceriferus*, Anderson.

Coccus ceriferus, Anderson, Monograph Cocco Ceriferi., 1791.

Ceroplastes ceriferus, Signoret, Ann. Soc. Ent. Fr. (2), VI, 1872, p. 40.

Ceroplastes ceriferus, Atkinson, I. M. N., I, 1890, p. 89.

Ceroplastes ceriferus, Stebbing, Ind. Forester, XXI, 1895, p. 328.

Ceroplastes ceriferus, Newstead, I. M. N., III, 5, 1896, p. 21.

Ceroplastes ceriferus, Green, C. of C., Pt. IV, 1909, p. 270, pl. CH.

Habitat. On Indian elm and *Laursonia alba* (Coimbatore), on *Bassella* (Tanjore). This insect was first noted at Madras on *Celastrus ceriferus* by Dr. Anderson. It has been recorded later on *Asclepiodora* from Madras and on spp. of *Terminalia* and *Bachanania* in the Central Provinces. This is the white wax insect of India (see I. M. N., II, 3, 1891). The presence of this insect on a plant is easily made out. The mature insect resembles irregular masses of pale white wax or baker's dough attached to the leaves and shoots.

62. *Ceroplastes actiniformis*, Green. (Pl. VII, fig. 22.)

Ceroplastes actiniformis, Green, I. M. N., IV, 1, 1896, p. 8.

Ceroplastes actiniformis, Green, C. of C., Pt. IV, 1909, p. 275, pl. CIV.

Ceroplastes actiniformis, Kaserode, B. J., XXIII, 1914, p. 136.

Habitat. On coconut leaves (Coimbatore, Malabar), mango (Coimbatore), *Canna* (Sannakota, Godavari District), *Ficus* (Penukonda, Anantapur District), *Calophyllum* (South Kanara District). Noted on *Loranthus* and banyan in Poona, and on coconut and other palms, *Canna* and *Sapium* in Ceylon. The insect has a thick waxy spherical test; the marginal area is divided into 8 portions which enclose a central cone-shaped area. The colour is pale white. I have occasionally found colonies of this scale, young and mature, along the folded

inner surface of the leaves of the coconut palm; but the insect does not appear to be very destructive to the plant. On *Calophyllum* it was once found pretty bad; the leaves were covered with colonies of scales and sooty mould.

63. *Ceroplastes rubens*, Mask. (Pl. VII, fig. 23.)

Ceroplastes rubens, Maskell, N. Z. Trans., XXV, 1892, p. 211.

Ceroplastes rubens, Green, I. M. N., V, 1, 1900, p. 8.

Ceroplastes rubens, Green, Mem. Dept. Agr., India, Ent. Ser., II, 1908, p. 32.

Ceroplastes rubens, Green, C. of C., Pt. IV, 1909, p. 273, pl. CIII.

Habitat. On mango (*Chicocole*), palm, *Cycas revoluta* (Cocanada), *Calophyllum* (Coimbatore), and jak (Palghat). The waxy covering of the insect has a pinkish colour and there are a few marginal narrow bands of white. The insect is popularly called the "The Red Wax Scale" and it is generally found along the ribs of the leaf. Previous record in India was from Assam. In Ceylon, Green records it on tea, mango, *cinnamon*, *Eugenia*, etc.

64. *Ceroplastes floridensis*, Comst.

Ceroplastes floridensis, Comstock, Rept. U. S. A. Dept. Agr., 1880, p. 331.

Ceroplastes floridensis, Green, I. M. N., V, 1, 1900, p. 8.

Ceroplastes floridensis, Green, C. of C., Pt. IV, 1909, p. 277, pl. CV.

Habitat. On leaves of cashew (*Anacardium occidentale*). Bangalore, and on *Michelia*, Courtallum, Tinnevely District. The waxy test is more or less similar to *rubens* but can be distinguished by the recurved edges of the same and the eight pale white spots on the margin instead of the four narrow bands of *rubens*. Previous Indian record from Assam and Darjiling. Green records it on tea and guava in Ceylon. Noted on numerous other fruit trees in America. My Assistant Mr. Isaac recently noted this species on tea in Travancore.

VINSONIÆ, Sign.

65. *Vinsonia stellifera*, Westw. (Pl. IX, fig. 24.)

Coccus stellifera, Westwood, Pr. Ent. Soc., Lond., 1871, pp. 3 and iii.

Vinsonia stellifera, Douglas, Ent. Mon. Mag., XXV, 1888, p. 152.

Vinsonia stellifera, Green, C. of C., Pt. IV, 1909, p. 280, pl. CVI.

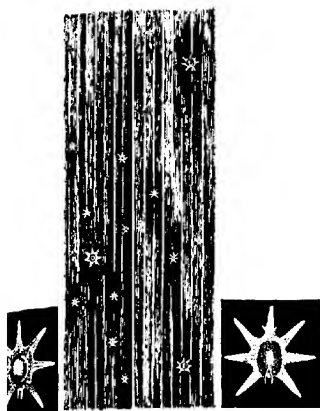


Fig. 24. *Wastgia stellifera*, Westw., on coconut leaf.

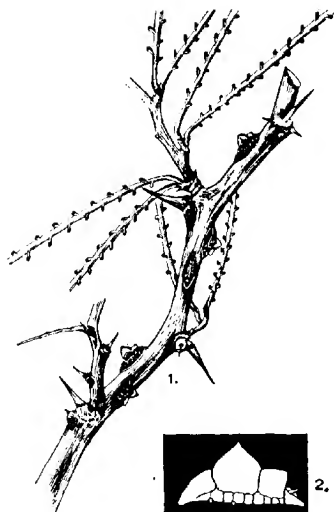


Fig. 25. *Inglistia chebuioides*, Green.
(1) Scales on *Parkia* plant; (2) Female scale, magnified.

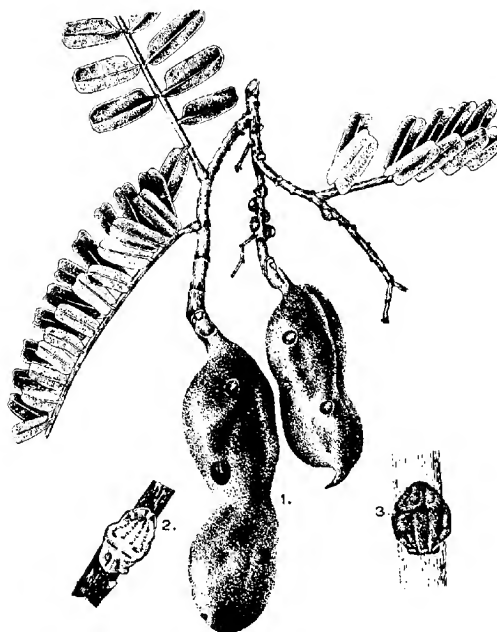


Fig. 26. *Inglistia* sp.

Habitat. On mango (Coimbatore), on nutmeg leaves (Tinnevely) on coconut palm (Malabar), and on rose-apple leaves *Eugenia jambos* (Godavari District). Along the South Malabar coast, I found this pretty insect fairly common on the coconut palm: but I did not note it doing any appreciable damage like *Aspidiotus destructor*, though often found in company with it. The waxy secretion in this insect is drawn out radially into seven ray-like projections which give it the appearance of a star-fish. Very recently it has been reported to be very common on rose-apple in Porto Rico. Green notes it on mango, coconut, etc., in Ceylon. Recorded from Bombay on *Garcinia indica*.

INGLISIA, Maskell.

66. *Inglisia chelonoides*, Green. (Pl. IX, fig. 25.)

(C. of C., Pt. IV, 1909, p. 283, pl. CVII.)

Inglisia chelonoides, Gr., Ramakrishna Ayyar, B. J., XXIV, 1916, p. 378.

Habitat. On *Parkinsonia aculeata*, Coimbatore. The species was first described by Green from a single example he got on a small twig of *Gelonium lanceolatum* in Ceylon. I found the insect in fairly good numbers on *Parkinsonia* and sent some specimens to verify whether they belonged to this species. In confirming my determination, Mr. Green wrote, "I am delighted at the possession of further material of this beautiful species and am very interested to find that my prediction as to the thorny habitat of the insects has proved to be correct." The scales very closely resemble the thorns on its food-plant and their presence could be made out only by close observation. The insect is covered by a cone-shaped glassy test and the same seen through the test has a brownish colour. Immature insects are uniform white. A small Chalcidid parasite has been noted attacking this insect. Not recorded before from India.

67. *Inglisia bicauleta*, Green.

(I. M. N., V, 3, 1903, p. 95.)

Habitat. Described by Green from specimens collected on *Thesia papulosa* in Rameswaram island, 1903.

I collected a solitary specimen on red gram stem at Mandepettra in Godavari District in December 1916. The insect hardly appears a living thing. The body of the insect is covered over by "two glassy shell-like plates meeting along the median longitudinal line." (See Lefroy, *Indian Insect Life*, fig. 529.)

CEROPLASTODES, Ckll.

68. *Ceroplastodes cajani*, Mask.

Eriochiton cajani, Maskell, I. M. N., II, 1891, p. 61.

Ceroplastodes cajani, Cockerell, Nature, LXI, 1900, p. 368.

Ceroplastodes cajani, Green, C. of C., Pt. IV, 1909, p. 285, pl. CVIII.

Ceroplastodes cajani, Fletcher, South Ind. Ins., p. 512, f. 400.

Habitat. On red-grain (Coimbatore and Godavari), on lablab vine and *Zizyphus* shoots (Coimbatore), also found on the sacred *Tuls*i plant (*Ocimum sanctum*) in many places. On the main vines of lablab the insect is found in shining white masses often considerably weakening the growth of the vine. The test is glassy and oval in shape with a rugose surface. A species of *Enblennia*—a Noctuid caterpillar—is predaceous on the scale. The species was first described by Maskell from specimens collected on red-grain from Madras in 1891. Very often *Tuls*i plants are killed outright by the attacks of this insect.

LECANIUM, Barmeister.

69. *Lecanium nigrum*, Nietn.

Lecanium nigrum, Nietner, Enemies of Coffee Tree, 1861, p. 9.

Lecanium nigrum, Green, I. M. N., I, 2, 1889, p. 117.

Lecanium nigrum, Cotes, I. M. N., II, 6, 1893, p. 168.

Lecanium nigrum, Green, C. of C., 1896, p. 229, pl. LXXXIV.

Saissetia nigra, King, Psyche, IX, 1902, p. 296.

Coccus nigrum, Kirkaldy, Faun. Haw., Pt. III, 1902, p. 106.

Lecanium nigrum, Fletcher, South Ind. Ins., pp. 514-515, f. 403.

Habitat. On cotton, *Croton*, *Hibiscus esculentus*, *Hibiscus rosasi-nensis*, *Thespesia populnea*, *Hygrophila spinosa*, sandalwood (Coimbatore); also on nutmeg shoots, Courtallum (Tinnevely). The shape of the scale is somewhat oval and very convex in form; the colour varies from deep chocolate brown to bluish black.

Known as the "black bug" and recorded on various other plants including coffee, rubber, etc. sometimes this assumes the role of a nasty pest. It has a world-wide distribution. On the *Portia* tree (*Thespesia*) I have found it doing serious damage.

Recently in a bad attack of this pest on cotton in Coimbatore. I noted a small Chalcidid wasp—very similar in appearance to *Scutellista cyanea*, Mots.—acting as a very effective natural check on this scale.

70. *Lecanium hemisphaericum*, Targ.

Lecanium hemisphaericum, Targioni Tozzetti, Studi sulle Cocciniglie, 1867, p. 27.

Lecanium coffea, Cotes, I. M. N., I, 1889, p. 117.

Lecanium hemisphaericum, Green, C. of C., 1896, p. 232, pl. LXXXV; Fletcher, South Ind. In-s., p. 514, f. 402.

Saissetia hemisphaerica, Cockerell, The Ent. Student, II, 1901, p. 32.

This well-known insect is known as the "brown bug of coffee" in South India.

Habitat. It has been noted on coffee, ferns, tea, guava, *Tabernaemontana*, etc. The scale is very convex and spherical in shape and has a chocolate brown colour. It is a serious pest of coffee in the planting districts of South India and is often found in company with the "green bug" *Lecanium viride*. There is a good deal on record regarding the pests of coffee in the second reference noted above. Numerous hymenopterous parasites have been noted on this insect.

71. *Lecanium hemisphaericum*, var. *filicum*, Bdv.

Lecanium filicum, Signoret, Ann. Soc. Ent., Fr., 1873, p. 136.

Lecanium hemisphaericum, var. *filicum*, Green, Ent. Mon. Mag., 1897, pp. 70-77.

Habitat. On garden ferns, Shevaroy's and Ganjam. This is popularly known as the "Fern scale" and is generally carried from place to place in cultivated ferns. Some coccidologists make this a separate species. General form more or less like *hemisphaericum*, but different from it in having some carinae on the surface. Colour shining reddish-brown.

72. *Lecanium hesperidum*, L.

Coccus hesperidum, Linn, Syst. Nat., (ed. X) 1758, I. p. 455.

Lecanium hesperidum, Burmeister, Hand. Ent., II, 1835, p. 69.

Lecanium hesperidum, Green, C. of C., I, 1899, p. 188, pl. LXII.

Lecanium hesperidum, Newstead, Mon. Br. Cocc., II, 1902, p. 78, pl. I.

Habitat. On coconut leaf, Madilagam, South Malabar, and on *Citrus* shoots, Mandapetta, Godavari.

The scales are pale yellowish-brown in colour, and a number of them are found together in patches on the coconut leaves visited by ants. Green doubts whether the material on coconut is *hesperidum*. He says "not typical; the antennae show a tendency to become 8-jointed and the dermal cells are obscure." Noted by Green in Ceylon on *Amaranthus*, *Bignonia*, etc. This is known as the "soft scale" and has a

world-wide distribution. Professor Newstead who discovered the winged male has very recently described it on p. 369, *Bull. Ent. Res.*, VII, 1917. Very recently I have collected this insect on red-gram stem also in Godavari. No previous record from India.

73. *Lecanium oleæ*, Bernard. (Pl. IX, fig. 26.)

Lecanium oleæ, Walker, Cat. Br. Mus. Hom., 1852, p. 1079.

Lecanium oleæ, Green, C. of C., 1899, p. 227, pl. LXXXIII.

Saissetia oleæ, Cockerell, Ent. Student, II, 1901, p. 31.

Lecanium oleæ, Newstead, Mon. Br. Cocc., II, 1902, p. 126, pl. LVII.; Fletcher, South Ind. Ins., p. 515, f. 404.

Habitat. On tamarind fruits and stalks. *Erythrina* leaves and shoots, and stem of *Hygrophila spinosa* (Coimbatore); on coffee (Coorg), on *Sesbania*—*Agathi*—(Bellary), and on *Thespesia* in different places. This is the common olive scale of European countries. The scale is chitinous and hard and has a very convex form with angular prominence; the body of a mature adult has two lateral and one transverse carinae forming the shape of an H; the colour dull purplish brown. Immature ones have a yellowish brown tinge. It has been noted on a variety of plants in Ceylon.

74. *Lecanium longulum*, Douglas.

Lecanium longulum, Douglas, Ent. Mon. Mag., 1887, p. 97.

Lecanium longulum, Green, I. M. N., IV, 1896, p. 8.

Lecanium longulum, Green, C. of C., p. 221, pl. LXX.

Lecanium longulum, Newstead, Mon. Br. Cocc., II, 1902, p. 89, pl. L.

Habitat. On red-gram stem, Mandapetta, Godavari District; both adult and the orange-coloured larvæ found together. The smooth yellowish brown females are much longer than broad. The species resembles *Lecanium hesperidum* to some extent, the young may be mistaken for the latter; but the number of antennal joints in the latter are seven and in *longulum* eight. Noted by Green on *Aecia*, *Albizia*, *Loranthus*, etc., in Ceylon, and by others on *Citrus* in America. No previous record from India.

75. *Lecanium (Paralecanium) expansum* Green.

Lecanium expansum, Green, I. M. N., IV, 1, 1896, p. 9.

Lecanium (Paralecanium) expansum, Green, C. of C., 1899, p. 235, pl. LXXXVI.

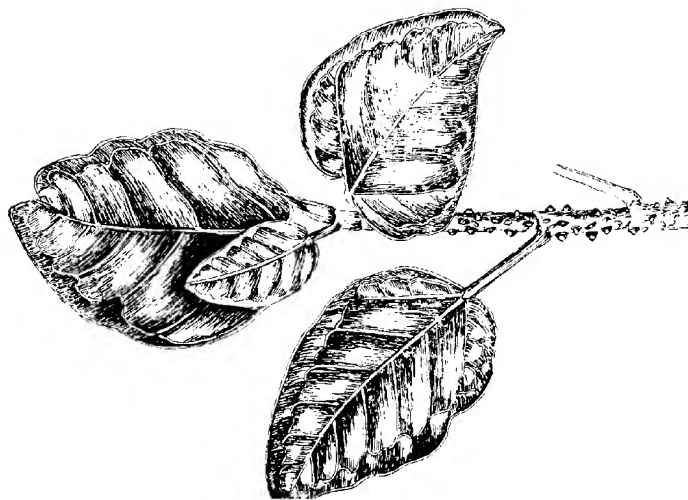


Fig. 27. *Larentia munda* (Hübner). 1. Larva. 2. Pupa. 3. Adult. 4. Egg. 5. Larva. 6. Pupa. 7. Adult. 8. Egg. 9. Larva. 10. Pupa. 11. Adult. 12. Egg. 13. Larva. 14. Pupa. 15. Adult. 16. Egg. 17. Larva. 18. Pupa. 19. Adult. 20. Egg. 21. Larva. 22. Pupa. 23. Adult. 24. Egg. 25. Larva. 26. Pupa. 27. Adult. 28. Egg. 29. Larva. 30. Pupa. 31. Adult. 32. Egg. 33. Larva. 34. Pupa. 35. Adult. 36. Egg. 37. Larva. 38. Pupa. 39. Adult. 40. Egg. 41. Larva. 42. Pupa. 43. Adult. 44. Egg. 45. Larva. 46. Pupa. 47. Adult. 48. Egg. 49. Larva. 50. Pupa. 51. Adult. 52. Egg. 53. Larva. 54. Pupa. 55. Adult. 56. Egg. 57. Larva. 58. Pupa. 59. Adult. 60. Egg. 61. Larva. 62. Pupa. 63. Adult. 64. Egg. 65. Larva. 66. Pupa. 67. Adult. 68. Egg. 69. Larva. 70. Pupa. 71. Adult. 72. Egg. 73. Larva. 74. Pupa. 75. Adult. 76. Egg. 77. Larva. 78. Pupa. 79. Adult. 80. Egg. 81. Larva. 82. Pupa. 83. Adult. 84. Egg. 85. Larva. 86. Pupa. 87. Adult. 88. Egg. 89. Larva. 90. Pupa. 91. Adult. 92. Egg. 93. Larva. 94. Pupa. 95. Adult. 96. Egg. 97. Larva. 98. Pupa. 99. Adult. 100. Egg.

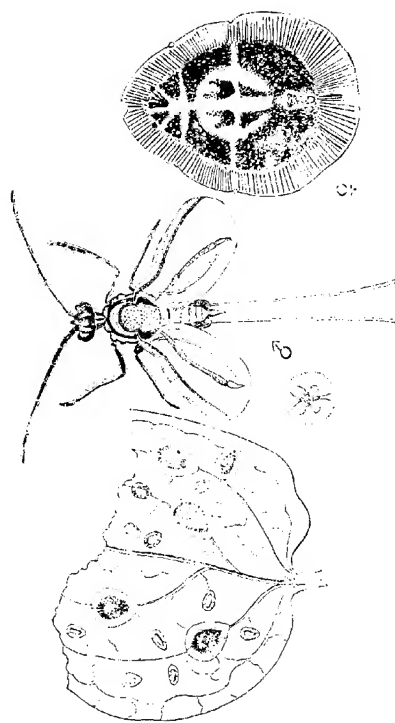


Fig. 28. *Larentia undecimfida* (Gron). On the left is a portion of leaf, proper with male and female scales, natural size; in the centre is wing; 1, male; and on the right an adult female, natural size. (After Green.) (From *South Indian Insects*, fig. 405.)

Lecanium expansion, Green, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 29.

Habitat. On *Calophyllum*, Madras and S. Arcot. Sometimes bad on this plant. Recorded before on *Ficus retusa* from Mysore.

76. *Lecanium formicarii*, Green.

Lecanium formicarii, Green, I. M. N., IV, 1, 1896, p. 10.

Lecanium formicarii, Green, C. of C., 1896, p. 190, pl. LXIV.

Lecanium formicarii, Green, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 29.

Habitat. On undetermined plant, Mysore (Lefroy coll.). I have not seen this interesting form which is said to be found enclosed in nests of ants—especially the ant *Crematogaster dohrni*. Noted by Green on tea, cinetona, Macaranga, etc., in Ceylon.

77. *Lecanium ramakrishnae*, Green MS. (Pl. X, fig. 27.)

Habitat. On distal shoots of *Ficus bengalensis*, Kothapetta (Godavari District). The adult scales have a bluish-black colour, and in shape the scale is more or less conical. The young insects are of a pale yellowish brown colour and found in company with the adults.

78. *Lecanium signiferum*, Green.

Lecanium signiferum, Green, C. of C., 1899, p. 197, pl. LXVIII.

Habitat. On plantain leaf, Golconda (Vizagapatam District). The scale is yellowish green in colour. On the dorsal surface a reddish brown mark in the form of a long stripe with two cross bars is prominent. No previous record from India.

79. *Lecanium adersi*, Newstead.

(Newstead, Bull. Ent. Res., VII, 1917, p. 357.)

Habitat. On mango (Coimbatore). The females are very flat, irregularly oval and chocolate-brown in colour; the male puparia are smaller and glassy white in appearance. Both male and female puparia are found in numbers on the inner surface of the leaves; the females are chiefly found along the midribs. No previous record from India. Professor Newstead has only recently described the form, for the first time, from specimens collected on mango in Zanzibar in the above reference. I have very recently discovered the winged male from specimens on mango

80. *Lecanium tessellatum*, Sign.

Lecanium tessellatum, Signoret, Ann. Soc. Ent., Fr., 1873 p. 401.

Lecanium tessellatum, Green, I. M. N., IV, 1, 1896, p. 9.

Eucalymnatus tessellatus, Cockerell, A. M. N. H., IX, 1902, p. 453.

Habitat. On *Calophyllum* leaves (Coimbatore). The flattened oval reddish-brown scales are easily made out on the leaves though they are not found together in numbers but only isolated. Noted elsewhere on palms, *Sapindus*, ferns, etc. No previous record from India.

81. *Lecanium mercure*, Green MS.

Habitat. On coffee, Mercara, Coorg (Fletcher coll.). Mr. Green who kindly identified the species is expected to describe it elsewhere.

82. *Lecanium gymnospori*, Green

Lecanium gymnospori, Green, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 29.

Coccus gymnospori, Sanders, U. S. A. Bull., Tech. Series, No. 16, Pt. III, 1909, p. 45.

Habitat. On *Gymnosporia*, Narasaraopet, Guntur District. First described by Green from specimens collected by Lefroy. No locality given.

83. *Lecanium marsupiale*, Green. (Pl. X, fig. 28.)

Lecanium marsupiale, Green, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 30.

Lecanium marsupiale, Green, C. of C., Pt. III, 1899, p. 212, pl. LXXV; Fletcher, South Ind. Ins., p. 516, f. 405.

Habitat. On pepper leaves (South Wynad, Malabar and Anamalais). The flat shining reddish-brown scale is comparatively larger in size than many species. Green notes it on *Annona* and *Palaus* in Ceylon. The deep pouch on each side of the under surface of the abdomen is quite characteristic; the young are found in these pockets.

84. *Lecanium depressum*, Targ.

Lecanium depressum, Targioni Tozzetti, Coccidæ, 1869 p. 29.

Lecanium depressum, Signoret, Ann. Soc. Ent., Fr., 1873, p. 439.

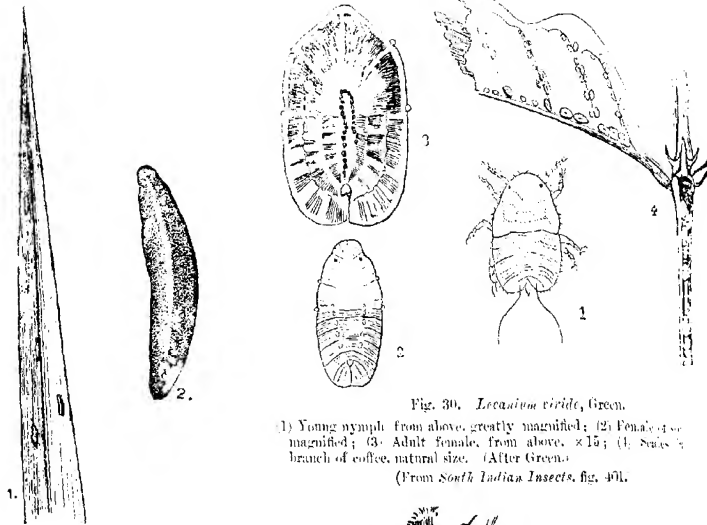


Fig. 29. *Lecanium aculeosum* Green.

(1) Scales on coconut leaf; (2) a magnified scale.

Fig. 30. *Lecanium viride*, Green.

(1) Young nymph from above, greatly magnified; (2) Female, etc., magnified; (3) Adult female, from above, $\times 15$; (4) Scales on branch of coffee, natural size. (After Green.)

(From *South Indian Insects*, fig. 461.)

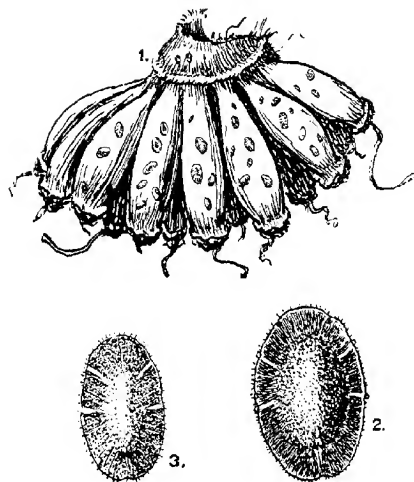


Fig. 31. *Lecanium discrepans*, Green.

(1) Scales on plantain fruits; (2 and 3) scales in different stages of growth.

Habitat. On *Eranthium*, *Thespesia populnea* and plantain leaf (Coimbatore). No previous record from India. Maskell considers this synonymous with *Lecanium nigrum*, N. (vide *Entomologist*, 1894).

85. *Lecanium acutissimum*, Green. (Pl. XI, fig. 29.)

Lecanium acutissimum, Green, I. M. N., IV, 1, 1896, p. 10.

Lecanium acutissimum, Green, C. of C., 1899, p. 218, pl. LXXXIII.

Habitat. On coconut leaf, Coimbatore. Few isolated ones only. I also found a specimen on mango leaf recently.

The scales are long and very narrow and pointed at both ends. In colour the scale is deep reddish brown to black. Green records it on coconut, Areca, *Piper*, mango, etc., in Ceylon. No previous record from India.

86. *Lecanium viride*, Green. (Pl. XI, fig. 30.)

Lecanium viride, Green, Ent. Mon. Mag., XXV, 1899, p. 248.

Lecanium viride, Cotes, I. M. N., 1889, pp. 49-117 (a long account).

Lecanium viride, Cotes, I. M. N., II, 1893, p. 166.

Lecanium viride, Cotes, I. M. N., III (b), 1894, p. 18.

Lecanium viride, Green, C. of C., 1899, p. 199, pl. LXIX; Fletcher, South Ind. Ins., p. 513, fig. 401.

The adult insect is bright pale green with an irregular loop of dark spots seen through the dorsal surface of the body which can be clearly noted. By this structure it can be easily distinguished from allied forms. This is the notorious "green bug" of coffee commonly found in the planting districts of South India and one of the very few well-known scale insects of this region. Considerable damage by this pest to coffee is now and then reported from the Shevaroyes and the Nilgiris. It has recently appeared in Coorg and Mysore also. In 1899, Mr. E. E. Green wrote from Ceylon that "the green scale has practically wiped out coffee cultivation in many districts." A good account is given of this pest in the pages of *Indian Museum Notes* quoted above.

Habitat. Besides coffee it has been noted on *Citrus* trees (Bangalore and Nilgiris), *Aegle* and *Carissa* (Coimbatore), and tea, guava, *Citrus*, *Plumiera acutifolia*, etc., on the Nilgiris. Some Chalcidid parasites are also found. Very often found in company with *Lecanium hemisphaericum*. Some predaceous Coccinellids have also been noted on this pest, but it is doubtful whether any of these play any effective part as natural enemies.

87. *Lecanium (Coccus) colemani*, Kaun.*

(Bull. No. 4, Ent. Series, Mysore Agr. Dept., p. 14, 1918.)

Habitat. On coffee, Mysore. I have not seen this species. It is very closely allied to *L. viride*, Green, though some structural differences are said to be present between the two. It is probably only a local race of the "green scale".

88. *Lecanium ophiorrhiza*, Green.*Habitat.* On *Diospyros chloroxylon*, Kurnul (Isaac coll.).

Noted before from Ceylon; new to India.

89. *Lecanium discrepans*, Green. (Pl. XI, fig. 31.)*Lecanium discrepans*, Green, C. of C., Pt. III, 1904, p. 204, pl. LXXX.

Habitat. On mango leaf, Palacole, Godavari District. Very closely allied to *L. formicarii*, Gr. Green records this insect on tea and in nests of the ant *Crematogaster dalryi*. Not recorded from India till now.

Lecanium, sp.

A species of *Lecanium* on *Agave* leaf-sheath, Cuddappah, sent to Mr. Green: is reported to be possibly new, but the specimens were found imperfect.

HEMILECANIUM, Newstead.

90. *Hemilecanium imbricans*, Green. (Pl. XII.)*Lecanium imbricans*, Green, I.M.N., V, 3, 1903, p. 91.*Hemilecanium theobroma*, Newstead, Journ. Ec. Biol., III, 1908, p. 39 [good figures].*Hemilecanium imbricans*, Green, Journ. Ec. Biol., V, 1910, p. 6; Fletcher, South Ind. Ins., pp. 516-517, fig. 406.

Habitat. On stem of *Jatropha multifida*, a common garden plant (Coimbatore).

The scale is large, about half an inch in diameter, and one of the largest of scales. Colonies of these are found on the main stem and shoots of the host-plant, the whole mass giving a glittering white appearance. The external structure of the scale is quite protective and whole mass of these scales will be easily mistaken for the bark of the plant. "The insect imitates little bosses or excrescences on the bark of the plant stem and so deceptively in shape and colouring that it requires some experience before you recognize the animals as such." Originally described by Green from specimens collected on *Ficus mysorensis* by Dr.

*Mr. Green (p. 149 of T. E. S.) says: "It seems questionable if there is sufficient justification for the erection of this new species".

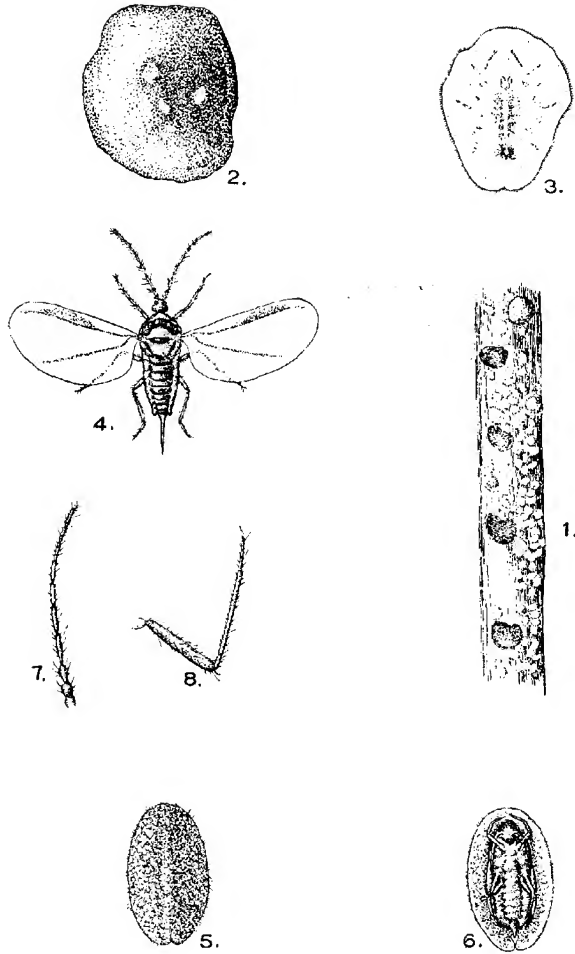


Fig. 32. *Hemiteles minutus lubricus*, Green.

1. Young and old scales on *Jatropha* stem; 2. Female scale, dorsal view; 3. Female scale, ventral view; 4. Adult winged male; 5. Male puparium, dorsal view; 6. Male puparium, ventral view; 7. Antenna of male; 8. Leg of male.

Watt. Noted on *Ficus*, spp. and red cedar in Mysore and the Shevaroyes. Found as a pest of cacao in Africa, hence the specific name given by Newstead. I recently noted this on *Ailanthus excelsa*. A sooty black blight on the main stem and branches of a tree attracted my attention and the same was found to be the result of an attack by this insect. I have discovered the winged male which has not been noted till now. The male is 3 mm. long and of a pinkish colour covered with a mealy white bloom. The costal nervure of the wing is deep purple. No caudal filaments present.

DACTYLOPIINÆ.

This subfamily includes those Coccidæ which are popularly known as "mealy-bugs".

DACTYLOPIUS, Costa.

91. *Dactylopius indicus*, Green.

Coccus indicus, Green, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 28.

Coccus cacti, var. *ceylonicus*, Green, I.M.N., IV, 1, p. 212, 1896, p. 7.

See also I. M. N., IV, 1, for Maskell's remarks on this species.

Habitat. On *Opuntia*, Mandapetta, Godavari District, December. This is the well-known wild cochineal insect famous for its beautiful dye. It was found in abundance in December on prickly pear. The soft mealy-covered females are found crowded at the roots of fresh buds and thorns. The colour of the female is purple brown but is densely covered over by white mealy matter. The tiny delicate two-winged male is seen crawling over these colonies. The body and the limbs of the male are purple-red with a bloom of mealy matter. The wings are snow white. The two posterior processes long and curved at the tip. The puparia of the male are all found in patches resembling the white cocoons of minute parasitic wasps—snowy white in colour and cylindrical in shape. Not found on *Opuntia* sp. in the Southern districts.

PSEUDOCOCCUS, Westwood.

(*Dactylopius* of authors.)

92. *Pseudococcus citri*, Risso.

Durhesia citri, Risso, Essay on Natural His. of Oranges, 1813.

Dactylopius citri, Signoret, Ann. Soc. Ent., Fr., 1875, p. 312.

Dactylopius citri, Green, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 22.

Dactylopius citri, Newstead, Mon. Br. Cocc., II, 1902, p. 164.
Dactylopius citri, Lefroy, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 122; Fletcher, South Ind. Ins., pp. 508-509, fig. 396.
Pseudococcus citri, Clausen, Calif. Agri. Expt. Stn. Bul. No. 258, 1915, p. 21.

Habitat. Found on cacao pods in the Government Gardens, Kallar, Nilgiris, in midsummer. Some of the pods were found badly infested with this mealy-bug and visited by ants in numbers. The adult bug is roughly oval and covered with white powdery wax and having numerous short waxy processes along the margin.

Noted before on coffee in Mysore, and on coffee seedlings and on roots of *Erythrina* and *Agaveatum* in Coorg. The insect has a world-wide distribution and is known to be very destructive to *Citrus* and other trees in Europe and America. About forty-five different plants have been noted to be the hosts of this mealy-bug in the different parts of the world.

93. *Pseudococcus longispinus*, Targ. (Pl. XIII, fig. 33.)

Dactylopius adonidum, Signoret, Ann. Soc. Ent., Fr., 1875, p. 306.
Dactylopius adonidum, Cotes, I.M.N., II, 6, 1893, p. 169.
Dactylopius longifilis, Barlow, I.M.N., IV, 1897, p. 75 (insect described).

Dactylopius longispinus, Newstead, Mon. Br. Cocc., II, 1903, p. 167, pl. LXIV.

Pseudococcus longispinus (new name), Newstead, Mon. Br. Cocc., II, p. 255, 1903.

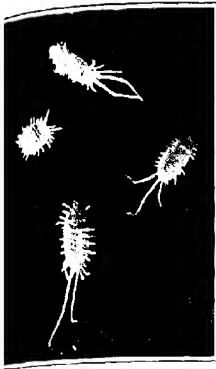
Pseudococcus longispinus, Clausen, Calif. Agri. Expt. Stn. Bull. No. 258, 1915, p. 35.

Habitat. On coconut leaves (Vadanapalle, South Malabar). Bad on young trees, covering the tender unopened fronds in masses. Ants visit them in numbers. Green says the specimens are not typical of the species.

The body of the adult bug is fringed with white waxy marginal processes; some of the caudal processes are pretty long and often longer than the body. This is known as "the long-tailed mealy-bug." Has been noted before on coffee and cedar in Mysore and on *Protium* in Calcutta. The host plants of this insect number over thirty.

94. *Pseudococcus virgatus*, Ckll. (Pl. XIII, fig. 34.)

Dactylopius virgatus, Cockerell, The Entomologist, 1893, p. 178.
Dactylopius ceriferus, Newstead, I.M.N., III, 5, 1895, p. 21.
Dactylopius talini, Green, I.M.N., IV, 1, 1896, p. 7.



Psalidococcus insignipennis. Targ.
(After Esig.)

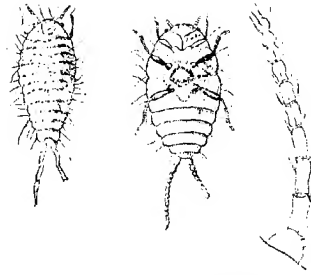


Fig. 34. *Psalidococcus virgatus*, Uell.
Dorsal and ventral views of insect enlarged and
antenna (more highly magnified). After Newstead.
(From *South Indian Insects*, fig. 318.)

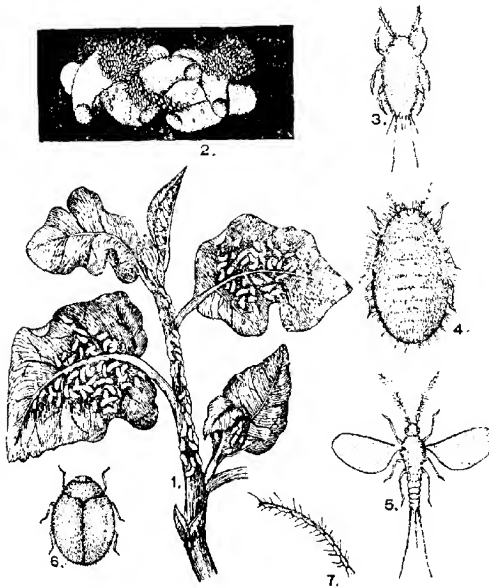


Fig. 35. *Phenacoccus insolitus*, Green.
(1) Mimosa shoot showing infestation; (2) Ovisacs showing young larvae emerging;
(3 and 4) young and older insects; (5) Adult male; (6) Coccinellid predaceous
on the insect; (7) Antenna of male.

Pseudococcus virgatus, Kirkaldy, Faun. Haw., III, pt. II, 1902, p. 103.

Habitat. Noted on *Crotoms*, tomato and some other plants (Coimbatore). On Cambodia cotton; Palur, South Arcot (March).

It was noted before in Madras in 1892 by Miss Tomlin. This is a fairly common insect often assuming pest proportions; the mealy masses of the colonies are often found killing tender plants outright.

95. *Pseudococcus sacchari* Ckll.

Dactylopius sacchari, Cockerell, Proc. Ac. Nat. Sc. Phil., 1899, p. 266.

Dactylopius sacchari, Green, I.M.N., V, 3, 1903, p. 102.

Pseudococcus sacchari, Newstead, Bull. Ent. Res., VIII, 1917, p. 126.

Habitat. Inside the leaf-sheaths of growing paddy plants. The insect often assumes pest conditions. The disease caused to paddy is called "Soorai" or "Chenchoorai" in the Tamil districts. In badly infested fields the indication of the pest attack is the presence of isolated patches of plants showing stunted growth and gradual fading. Professor Newstead describes the distinguishing features of the adult female in the latest reference noted above.

Found in parts of Coimbatore, Trichinopoly, Tanjore and South Arcot. A rather serious pest occasionally.

96. *Pseudococcus caryabatus*, Green MS.

Habitat. The insect is found in masses covering tender shoots and fruits of jak in Malabar. The colony is visited by the red ant *Eco-phylla smaragdina*. Noted on *Citrus* shoots and fruits; Palacole, Godavari District. It has also been noted to infest shoots of the cotton plant in Coimbatore. The insect is found in thick masses of mealy stuff. In some cases the bolls and shoots of cotton are completely covered up by this sticky white mass. No description of this species has yet been published, but Mr. Green is describing it in his forthcoming volume on the Ceylon Coccidæ.

97. *Pseudococcus crotomis*, Green (nom nud).

Dactylopius crotomis, Green, Tropical Agriculturist, XXIV, 8, 1905, p. 14.

Dactylopius crotomis, Green, Journ. Ec. Biol., 1915, p. 69.

Habitat. On *Adenophyllum* shoots and pomegranate fruit stalk, Coimbatore. On stem and crevices in stem of *Ficus indica*, Alamanda, Vizagapatam District.

Mentioned by Mr. Green in the above reference as attacking *Castilleja* rubber in Ceylon. A full description of the species has not

appeared yet. Probably will be found in Mr. Green's coming volume. Mr. Green says that the specimens from Vizagapatam are not typical.

98. *Pseudococcus viridis*, Newst.

Dactylopius viridis, Newstead, I.M.N., III, 5, 1891, p. 25.

Habitat. Noted by Miss Tomlin on *Pithecolobium* and *Hygrophila spinosa* in Madras in 1892, and described by Newstead in 1891.

99. *Pseudococcus cocotæ*, Mask.

Dactylopius cocotæ, Maskell, N.Z. Transactions, XXII, 1889, p. 149.

Dactylopius cocotæ, Cotes, I.M.N., II, 1893, p. 169.

Dactylopius cocotæ, Cotes, I.M.N., III, 1, 1893, p. 7.

Dactylopius cocotæ, Maskell, I.M.N., III, 1, 1893, p. 66.

Habitat. On coconut leaf, Malabar and the Laccadives. First noted in the latter locality in 1891 by Mr. Dumergue.

100. *Pseudococcus nipa*, Mask.

Dactylopius nipa, Maskell, N.Z. Trans., 1892, p. 232.

Dactylopius nipa, Green, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 23.

Dactylopius nipa, Lefroy, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 121.

Dactylopius nipa, Fletcher, Some South Indian Insects, 1911, pp. 509-510, fig. 397.

Habitat. On *Casuarina* stem Coromandel coast (Noted by V. Subramania Ayyar see page 8 *Imp. For. Bull.* No. 11, 1912). I have not seen the insect myself. It is very likely to be found on potatoes also, as is the case in North India, where it is often bad and destructive to seed potatoes.

PHENACOCUS, Ckll.

101. *Phenacoccus insolitus*, Green. (Pl. XIII, fig. 35.)

(Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 26.)

Phenacoccus insolitus, Newstead, Bull. Ent. Res., VII, 1917, p. 127.

Habitat. This is another insect which has been noted as a pest. It attacks the brinjal plant all over South India and has been noted specially in the Chingleput and Coimbatore districts. A plant when badly infested presents a white appearance from a distance looking as though lime was splashed over: its leaves, stem, and all become literally covered up: on the leaves it is the under surface that is found more infested. The young

larvæ are pale yellowish green in colour. The prompt destruction of attacked plants or spraying with a dilute contact poison will easily check the insect. The first record was from Pusa on *Sida cordifolia*. I have reared out the winged adult male which was not known till now. It is a tiny pink delicate creature with brownish eyes and transparent wings. The limbs and antennæ are well developed. There are four slender waxy filaments attached to the anal end of the body of which two are long and the other two short. A small Chalcidid parasite is found preying on the scale in numbers. The egg-sacs are cream-white and contain over 400 or 500 eggs which have an yellowish-green colour.

102. *Phenacoccus mangifera*, Green.

Pseudococcus mangifera, Green. I.M.N., IV, 1, 1896, p. 7.

Habitat. On mango, Coimbatore; on *Echitis* leaves and shoots, Anakapalle, Vizagapatam District; but these latter do not appear typical according to Mr. Green. This pale yellow mealy-bug is found commonly on mango around Coimbatore. The body is covered with white mealy matter and the margins have stout white processes. No previous record from India.

103. *Phenacoccus ballardi*, Newstead.

Habitat. On mango (Coimbatore), and on an undetermined plant in South Kanara. Professor Newstead has recently described this species in detail (*Bull. Ent. Research*, VIII, August 1917, p. 17). The species is very like *P. iceryoides*, Green.

104. *Phenacoccus iceryoides*, Green.

Phenacoccus iceryoides, Green. Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 26.

Phenacoccus iceryoides, Lefroy, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 129.

Habitat. On shoots of *Odium nodifer* in Coimbatore. On *Citrus* shoots; Palacole, Godavari District. On mango shoots and fruits; Mamanda, Vizagapatam District. Noted also on *Boscwellia* in Tanjore. In mango in Calcutta and on *Capparis* in Surat. It is pretty bad on mango and *Citrus* in the Northern Circars, and it is found destructive to the young shoots of *Odium nodifer* on the Coimbatore farm, the hoots and young leaves being literally covered with the bug. Recently I noted the Lysæenid butterfly, *Spalgis epus*, West., feeding in numbers on this mealy-bug.

Another species of *Phenacoccus* close to *mangifera* was noted on *Thespesia* in Cuddapah. Mr. Green says the material was too fragmentary for exact determination.

105. *Phenacoccus ornatus*, Green MS.

Habitat. On a wild creeper; Courtallum, Tinnevely.

Green says he has noted this on a species of jasmine creeper in Ceylon. It is a very delicate and pretty insect.

106. *Phenacoccus quarternus*, Green.

Habitat. On stem of *Casuarina* tree in the galleries of the borer *Arbelia* Coromandel Coast. See page 8 of V. S. Iyer's Bulletin on *Casuarina* pests. (*Imp. For. Bull.* 11 of 1912.)

RIPERSIA, Sign.

107. *Ripersia sacchari*, Green. (Fig. 36.)

(I.M.N., V. 2, 1900, p. 37.)

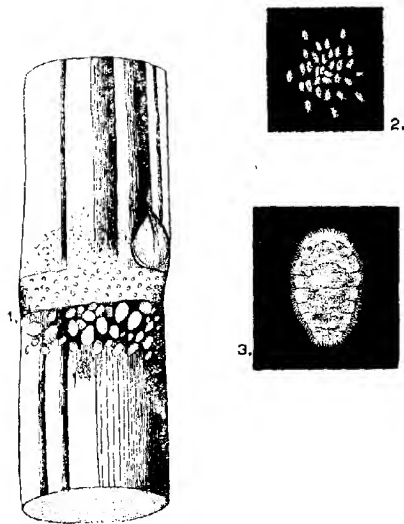


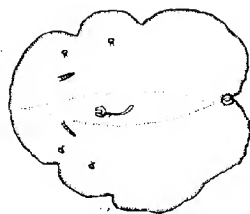
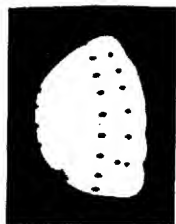
Fig. 36. *Ripersia sacchari*, Green.

(1) Scales on sugarcane (covering sheath of cane removed);
(2) Young larva; (3) later stage of larva.

EXPLANATION OF PLATE XIV.

Anomalococcus indicus, Green M.S.

1. Scale infested *Acacia* branch.
2. Adult female scale from nature, $\times 8$.
3. Do. do. mounted, $\times 14$.
4. Young larva, $\times 44$.
5. Cocoon of predatory moth on *Acacia* stem, $\times 3$.
6. Predaceous moth, $\times 6$.



Habitat. On sugarcane, Coimbatore. Sometimes this insect becomes serious and then the sheathing leaves at the lower regions of the cane show colonies of these pinkish white bugs. They anchor themselves chiefly at the nodes of the cane.

Green (*Mem. Dept. Agri., India, Ent. Ser., II* 1908, p. 25) speaks of some specimens got on rice plant in Benga' as more or less identical with this species. In the same publication (p. 128) Lefroy gives some details of the occurrence of this insect on paddy. I have my own doubt as to whether this is *Ripersia*.

Originally described by Green from specimens on cane collected at Gorakhpur in the United Provinces in 1900.

ANTONINA Sign.

108. *Antonina marii* nua, Green.

Habitat. On underground roots of grass (*Cygodon* sp.), Coimbatore. The insects are found attached to the underground roots of grass. The adult has a pale brown colour but this is fringed over with whitish mealy material. This is a species allied to "the nut grass coccid" (*Antonina australis*, Gr. recorded from Australia on *Cyperus rotundatus* in 1904.)

The Board of Revenue, Madras, suggested the introduction of this foreign insect into India in 1904 to eradicate the grass.

No previous record from India.

ASTEROLECANIINÆ.

ANOMALOCOCCUS, Green.

109. *Anomalococcus indicus*, Green MS. (Pl. XIV.)

Habitat. A scale very commonly found infesting the *babul* tree (*Acacia arabica*) on the Coimbatore College Farm. Sometimes it does considerable damage to young trees which become completely covered up with these white scales. The common black ant, *Camponotus compressus*, is found visiting the scales in numbers and colonies of this ant are found in nests at the foot of the infested tree. A species of Noctuid moth, *Enllemma*, is also found predacious on this scale.

CEROCOCCUS, Comstock.

110. *Cerococcus hibisci*, Green.

Cerococcus hibisci, Green, Ent. Mem. Dept. Agri. Ind., II, 19—21, t. 2, ff. 24 (1908); Lefroy, *l. c.*, p. 122; Fletcher, South Ind. Ins., p. 508, f. 395.

Habitat. On cotton and *Hibiscus rosa-sinensis*, Coimbatore, Godavari and Madura.

This is popularly known as the "yellow scale of cotton" as the scales have a pale yellowish colour. It is not found however as an important pest of cotton.

111. *Cerococcus bryoides*, Mask.

Planckonia bryoides, Maskell, New Zeal. Trans., XXVI, 1893, p. 81.

Asterolecanium bryoides, Cockerell, Check List, 1896, p. 328.

Habitat. On *Hibiscus rosa-sinensis*, Madras.

ERIOCCUCUS, Targ.

112. *Eriococcus araucariae*, Mask.

Eriococcus araucariae, Maskell, New Zeal. Trans., XI, p. 218, 1878.

Eriococcus araucariae, Green, Ind. Mus. Notes, IV, p. 7, 1896.

Habitat. On a Conifer; Lalbagh Gardens, Bangalore. In Ceylon, Green has found this bad on *Araucaria*. It was pretty bad also on the tree I noted in Bangalore.

113. *Eriococcus lagerstroemiae*, Kuw.

Bull. Agr. Exp. Stn., Japan, I. 2, p. 182, 1907. (Fig.)

Habitat. On a species of *Dalbergia*, Courtallum, Tinnevely.

ASTEROLECANIUM, Targ.

114. *Asterolecanium miltaris*, var. *longum*, Green.

Planckonia miltaris, Green, I. M.N. IV, 1, 1896 p. 5.

Asterolecanium miltaris, var. *longum*, Green, C. of C., 1909, p. 339, pl. CXXIX.

Habitat. On bamboo leaf, Coimbatore.

The narrow elongate scales become visible on the foliage only when carefully observed: the colour is like that of the bamboo leaf. Found on both sides of the leaf. No previous record from India.

TACHARDIANÆ.

TACHARDIA, Blanchard.

115. *Tachardia lacca*, Ker. (Pl. XV.)

Carteria lacca Sign., Ann. Soc. Ent., Fr., 1874, p. 102.

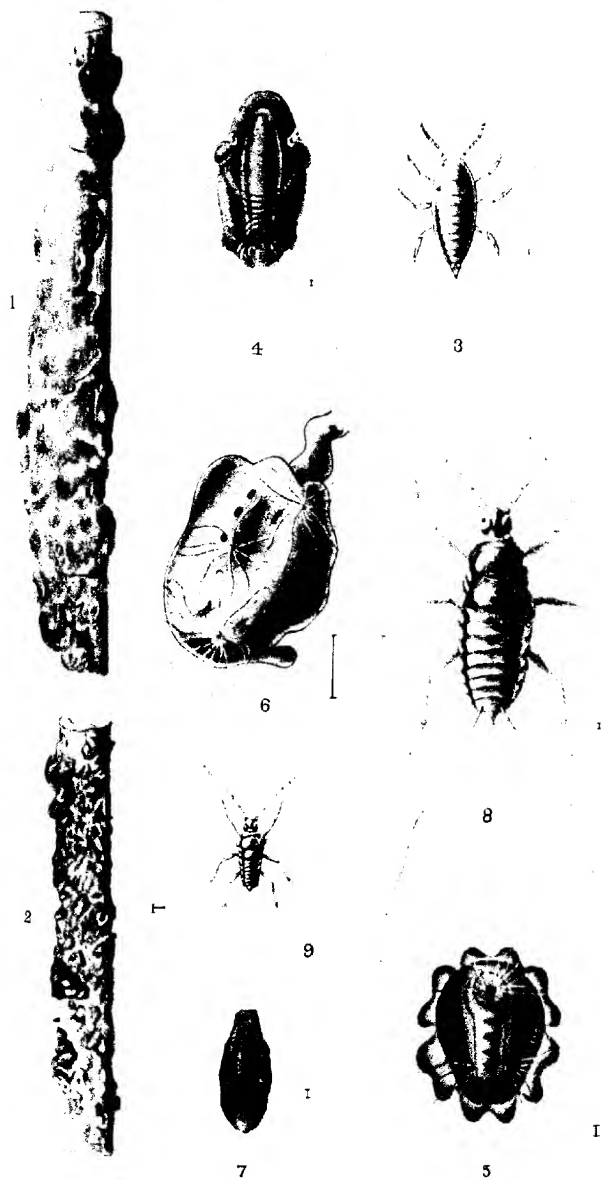
Tachardia lacca, Green, C. of C., 1896, p. 3.

Tachardia lacca, Imms and Chatterjee, Ind. Forest Mem., 1915.

EXPLANATION OF PLATE XV.

Tachardia lacea, Kerr.

1. Healthy insects on stick.
2. Unhealthy " " "
3. Young lac insect, $\times 40$.
4. A female, 4 weeks old, $\times 35$.
5. " 13 " $\times 15$.
6. Young lac insects emerging from a female cell, $\times 4$.
7. Male cell, 13 weeks old, $\times 12$.
8. Wingless male, $\times 12$.
9. Winged male. $\times 40$.



TACHARDIA LACCA. KERR.

Habitat. Noted on *Dalbergia lanceolaria* (Walayar forests); on mango (Saidapet) and on *Pongamia glabra* (Coimbatore).

This is the "lac insect" which forms the most important substance in the manufacture of commercial shellac. This insect was bred on *Zizyphus* trees on the Coimbatore farm and one fairly good crop was got. There is a good deal of literature on this useful insect in the *Indian Museum Notes* and in *Indian Forest Memoirs*.

116. *Tachardia lobata*, Green.

Habitat. On *Thespesia papulosa*, Madanapalle, Chittoor District. Mr. Green found one specimen of this species with some other material I submitted to him.

MARGARODINÆ.

MARGARODES Guilding.

The Coccids of this genus are what are known as "ground pearls" and are subterranean in habit. There is a good account of this genus by Mr. Green in the *Records of the Indian Museum*, VII, 1912.

117. *Margarodes formicarium*, Guild.

Margarodes formicarium, Guilding, T.E.S., 1828, p. 115.

Margarodes formicarium, Atkinson, J. A. S. B., LV. Pt. 2, No. 3, 1886.

Recorded as having been noted in South India. Mr. Green in his note on the genus *Margarodes* in the *Records of the Indian Museum*, VII, Pt. I, p. 65, 1912, doubts the collection of any species of this genus before *Margarodes indica* in 1910. He says *M. formicarium* is not reliable.

118. *Margarodes indica*, Green.

(Rec. Ind. Mus., VII, Pt. I, No. 5, 1912, p. 73.)

Bangalore and Bombay. Recorded by Green in the *Records of the Indian Museum*. There is no correct record of the exact habitat of this species.

119. *Margarodes niger*, Green.

(Rec. Ind. Mus., VII, Pt. I, 1912, p. 75.)

Habitat. In soil under roots of grass; colour of nymphal cyst opaque bill black. The cysts are liable to be mistaken for seeds of *Canna indica*. Mysore, Bellary and Coimbatore.

- 120. *Margarodes papillosa*, Green.

(Rec. Ind. Mus., VII, Pt. I, 1912, p. 74.)

Habitat. Bellary. In soil under grass (Ramachandra Rao coll.). Previous records from Bellary near egg-masses of Acridiid grasshoppers, and under rose plants, Bangalore.

MONOPHLEBINÆ.

MONOPHLEBUS, Burm.

121. *Monophlebus tamarindus*, Green.

Habitat. On garden *Crotons*; Samalkota, Godavari District.

122. *Monophlebus leachii*, Westw. (Pl. XVI, fig. 37.)

Monophlebus leachii, Westwood, Arc. Ent., I, 1841, p. 22.

Monophlebus leachii Atkinson, J. A. S. B., 1886, p. 293.

Drusiea leachii Cockerell, Ent., 1902, p. 283.

Recorded as got from Malabar and Pondicherry by Atkinson.

I have some more material of *Monophlebus*, but the different forms have not yet been specifically determined.

WALKERIANA, Sign.

123. *Walkeriana pertinax*, Newst.

Walkeriana pertinax, Newstead, P. Z. S., 1900, p. 197.

Aspidoproctus? pertinax, Newstead, Bull. Ent. Res., VIII, 1917, p. 125.

Habitat. Noted on a wild plant, Bangalore, June 1908. First described by Newstead from specimens got from Central Africa. No previous record of it from India. I found only one specimen. Professor Newstead finds very little difference in structure between my specimen and the cotypes regarding the larvæ found under the specimen.

124. *Walkeriana palei*, Green.

(I. M. N., IV, 1896, p. 6; and Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 19.)

Habitat. Recorded on an undetermined plant from South India. Originally described by Green from specimens collected on *Dodonaea viscosa* in Ceylon.

PLATE XVI.

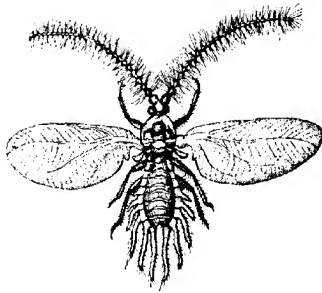


Fig. 37. *Monophlebotus leachi*, Westw.
Adult male. (From Westwood.)



Fig. 38. *Walckenaes cinnam.* Green, on
Laccaria stem.

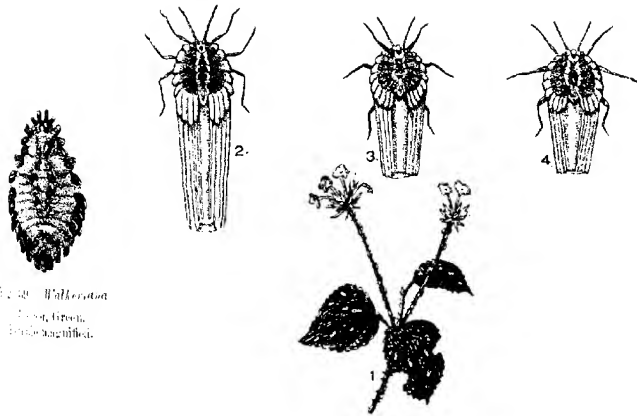


Fig. 40. *Orthezia laccariae*
Lantana, Green.
Enlarged.

Fig. 40. *Orthezia laccariae*, Dougl.

1: Scales on *Lantana*; 2, 3 and 4: Inset in different stages.

125. *Walkeriana cinerea*, Green. (Pl. XVI, figs. 38 and 39.)

Walkeriana cinerea, Green, Mem. Dept. Agri., India. Ent. Ser., II, 1908, p. 18.

Walkeriana cinerea, Lefroy, Mem. Dept. Agri., India. Ent. Ser., II, 1908, p. 121.

Habitat. Found in numbers on the stem of *Lawsonia alba* and sandalwood tree (Vadanapalle, South Malabar). On *Lawsonia* the insect was doing serious damage. The whole tree appeared sooty black, due to the mould, following the scale infestation. The colour of the adult insect very closely resembles that of the tree bark. Recently found on *Thespesia* in Coimbatore.

ICERYA, Signoret.

126. *Icerya seychellarum*, Westw.

Dorthisia seychellarum, Westwood, Gard. Chron., 1855, p. 830.

Coccus sacchari, Signoret, Ann. Soc. Ent., Fr., 1869, p. 93.

Icerya seychellarum, Maskell, N. Z. Trans., 1897, p. 329.

Icerya tangalla, Green, I. M. N., IV, 1, 1896, p. 7.

Icerya seychellarum, Green, Mem. Dept. Agri., India, Ent. Ser., II, 1908, p. 18.

Habitat. On *Cassia tora*; Kottur, Bellary District. Several bushes were found almost completely covered by colonies of this beautiful creature. The insect when alive has a beautiful pink and yellowish colour with numerous creamy white processes. Noted on mango in Bombay, and on *Casuarina* trees along the Coromandel Coast.

127. *Icerya ægyptiaca*, Dougl.

Crossosoma ægyptiacum, Douglas, En. Mon. Mag., 1890, p. 79.

Icerya ægyptiacum, Ril. and How., Ins. Life., III, 1891 (with figures), p. 97.

Icerya ægyptiaca, Newstead, Mon. B. Cocc., II, 1902, p. 248.

Habitat. On bread-fruit tree (*Artocarpus nicta*): Vadanapalle, South Malabar. On jak (*Artocarpus integrifolia*): Kallar, Nilgiris 1,200 feet. The tender shoots and leaves were found literally covered by this pest in masses of white cottony stuff. Found also on *Ficus* leaves; Simbachalam Vizagapatam District. Noted also on various garden plants in different places.

128. *Icerya pilosa*, Green.

Icerya pilosa, Green I. M. N., IV. 1. 1896, p. 7.

Icerya pilosa, Green, Mem. Dept. Agr., India, Ent. Ser., II, 1908, p. 18.

On *Spinifex squarrosus*, Madras (collected by Miss Taylor).

ORTHEZIANÆ.

ORTHEZIA Bosc.

129. *Orthezia insignis*, Dougl. (Pl. XVI, fig. 40.)

Orthezia insignis, Green, Trop. Agri., XXVI, 1895.

Orthezia insignis, B. J., XII, 1899, p. 547.

Orthezia insignis, Sanders, Journ. Ec. Ent., II, 1909, p. 430.

Orthezia insignis, Newstead, Mon. Br. Cocc., II, 1902, p. 236, pl. LXXV.

This is the well-known *Lantana* bug. Though it is fairly common in other countries and even in Ceylon, it has not appeared in South India. However, it was once noted in a plantation on the Nilgiris and I was told the pest was at once destroyed. A few insects from this lot appear to have been taken to Bangalore and were found in Dr. Coleman's office compound on *Lantana*. It would be very beneficial if it confines its ravages to this plant alone; but it is not unlikely that other and useful plants may be infested, if introduced. The adult female insect is easily distinguished by the peculiar arrangement of the white waxy laminae: the long tubular white ovisac at the anal end is the most striking feature. There are also short white waxy processes at the sides and a double row of similar processes along the back; the insect is olive green in colour and the legs are well developed. It has been noted to breed on more than thirty different host plants in Ceylon. This was recently (March 1919) sent up as damaging some wild plants from a tea estate in S. Wynaad. This is the first official report of this insect from within India.

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